1911

COLONY AND PROTECOTRATE OF KENYA.

ANNUAL REPORT

OF THE

DEPARTMENT OF AGRICULTURE

FOR THE

Year ended 31st March, 1921.

IMPERIAL BUREAU
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FARM COLONY

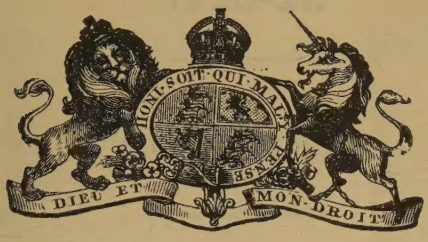
PRICE 2 SHILLINGS.

NAIROBI.

PRINTED BY THE GOVERNMENT PRINTER.

1922.

COLONY AND PROTECOTRATE OF KENYA.



ANNUAL REPORT

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ANNUAL REPORT
1920-21.

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ANNUAL REPORT
1920-21.

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STAFF LIST OF DEPARTMENT OF AGRICULTURE.

(As at March 31st, 1921).

Director:

Alex Holm, F.H.A.S., M.R.A.S.E., S.E.A.C., (Dip. Hons.).

Deputy Director:

E. Harrison, M.S.A., B.Sc. (Agric.), N.D.A. (Hons.).

---

1. ADMINISTRATIVE & GENERAL.

Personal Assistant and Advisor for Tobacco: C. J. Monson.

Satistical Officer: L. D. Carpenter, P.A.S.I.

Accountant: H. S. Land.

Office Superintendent: W. W. Wilson.

Clerks: F. Parker, J. Mortimer, E. W. McLachlan, R. J. Philip, W. J. Phillips, R. F. Dalzell-Armstrong, S. W. Austin.

Mycologist: J. McDonald, D.F.C., B.Sc. (Hons.).

Plant Breeder: G. L. J. Burton, M.C., B.A.

Advisor on Coffee: A. D. le Poer Trench.

Senior Flax Officer: W. G. Scott.

Flax Officers: G. M. Hamilton, J. J. Hughes.

Dairy & Pig Officer: Hon. H. J. H. Scott.

Horticulturist: C. B. Ussher.

Plant Import Inspector: A. H. Wilson.

Agricultural Instructor: J. W. Sparrow.

2. ECONOMIC PLANTS DIVISION.

CHIEF OF DIVISION: T. D. Maitland.

MANAGER MAZERAS EXPERIMENTAL FARM (ACTING): F. B. L. Butler.

OFFICER IN CHARGE KIBOS EXPERIMENTAL STATION: H. H. Holder.

FOREMAN PLANT INSTRUCTOR: J. B. Dopwell.

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3. DIVISION OF ENTOMOLOGY.

CHIEF OF DIVISION: T. J. Anderson, M.A., B.Sc. (Hons. Edin.), F.Z.S., F.E.S.

ENTOMOLOGISTS: F. W. Dry, B.Sc.; H. Wilkinson, A.R.C. Sc.

---

4. NAIVASHA STOCK FARM.

MANAGER: J. H. D. Beales.

STOCKMEN: J. Forsyth, A. E. Dircks.

---

5. KABETE EXPERIMENT FARM.

MANAGER: A. J. Wilson, M.C., C.D.A. (Edin.).

ASSISTANT MANAGER: C. B. Armstrong.

CLERK & STOREKEEPER: J. D. Ritchie.

---

6. ELDORET EXPERIMENT FARM.

MANAGER: J. Johnston, B. Sc., N.D.A., P.A.S.I.

VETERINARY.

1. ADMINISTRATIVE & EXECUTIVE.

CHIEF VETERINARY OFFICER (ACTING): W. Kennedy, D.S.O., M.R.C.V.S.

DEPUTY CHIEF VETERINARY OFFICER (ACTING): A. G. Doherty, M.C., M.R.C.V.S.

SENIOR VETERINARY OFFICERS: H. H. Brassey-Edwards, M.R.C.V.S.; O. Dixon, M.C., M.R.C.V.S.; R. C. Wheeler, M.B.E., M.R.C.V.S.

VETERINARY OFFICERS: A. W. Carter, M.R.C.V.S.; W. H. Reid, M.R.C.V.S.; A. S. Mathias, M.R.C.V.S., M.R.A.C.; J. N. Cooper, M.R.C.V.S.; G. B. Purvis, M.R.C.V.S.; R. S. Little, M.R.C.V.S., D.V.S.M.; R. L. Creery, M.R.C.V.S.; W. E. Phipps, M.R.C.V.S.

CHIEF QUARANTINE OFFICER: C. A. Neave.

OFFICE SUPERINTENDENT AND ASSISTANT ACCOUNTANT: A. C Hunter.

PERMIT OFFICER: J. B. Banks.

REGISTRAR OF BRANDS: J. E. Harrison.

STOCK INSPECTORS: H. G. Ulyate, E. E. Blayden-Taylor, D. Wyartt, A. Littlewood, R. A. C. Campbell, A. M. McIntosh, W. L. Lewis, G. White, E. Evans, J. Mackay, L. E. Smith, R. J. Knobel.

CLERKS: G. J. Robbins, R. A. Hawkins, J. L. Bryne, M.C

2. LABORATORY.

VETERINARY PATHOLOGIST: W. Walker, M.R.C.V.S.

ASSISTANT TO VETERINARY PATHOLOGIST: W. Kearney, M.R.C.V.S.

RESEARCH OFFICERS (ACTING): T. C. Bradshaw M.R.C.V.S.; S. H. Whitworth, M.R.C.V.S., B.V.S. (Melb.).

LABORATORY SUPERINTENDENT: A. Walker.

LABORATORY ASSISTANTS: J. T. Schultz, J. Ford, H. J. Gray, T. A. Goodwin, P. H. Poolman, J. R. McQueen.

OVERSEER: J. Burton.

YARD FOREMAN: A. Wight.

CLERKS: L. Myers, A. R. Ballot, W. White, A. E. Johnstone, A. J. Kemp.

MECHANIC: R. Kerr.

STOREKEEPER: J. Scott.

ASSISTANT STOREKEEPER: G. W. Clockley.

COLONY AND PROTECTORATE OF KENYA.

ANNUAL REPORT

OF THE

Department of Agriculture

FOR THE YEAR ENDED

31st March, 1921.

REPORT OF DIRECTOR.

Staff. The principal staff changes and new appointments during the period covered by this report were:—

New Appointments: E. Harrison, M.S.A., B. Sc. (Agric.), N.D.A. (Hons.), (Deputy Director of Agriculture); Capt. G. J. L. Burton, M.C., B.A., (Plant Breeder); J. Forsyth, (Stockman, Naivasha); A. E. Dircks, (Stockman, Naivasha); Capt. J. McDonald, D.F.C., B.Sc. (Mycologist); Hon. H. J. Scott, (Dairy and Pig Officer); W. G. Scott, (Senior Flax Officer); J. Hughes, (Flax Officer); W. W. Wilson, (Office Superintendent); W. J. Phillips, R. J. Philip, (Clerks).

Most of these new appointments were made towards the close of the period under review.

F. W. Dry, Entomologist, proceeded on leave pending retirement. I much regret to record the death of Mr. Henry Powell, Chief of the Economic Plants Division, who was on leave pending retirement. Mr. Powell's service with my predecessors was most useful in the development of the agricultural industry almost from its infancy in this Colony.

Five Veterinary Officers were appointed to the Senior grade, viz., Lt.-Col. A. G. Doherty, Mr. H. H. Brassey Edwards, Capt. O. Dixon, Capt. W. W. Henderson and Capt. R. C. Wheeler, M.B.E.

New appointments to the staff of Veterinary Officers were made as follows: J. N. Cooper, S. H. Whitworth, J. B. Purvis, R. L. Crery, Capt. W. E. Phipps and Capt. R. S. Little.

Veterinary Officers T. C. Bradshaw and S. H. Whitworth were transferred from the "Field" staff for duty at the Laboratory as Research Officers.

Captain W. W. Henderson, Veterinary Officer, resigned after having rendered good service over a period of seven years.

I regret to record the death of Captain J. Cameron, Veterinary Officer, after a short period of service efficiently rendered.

The appointments of the following Stock Inspectors H. Clift, A. H. Adams, C. Stephenson and T. Byatt Scott, terminated during the year.

The filling of a number of vacant appointments and the addition of certain new appointments has greatly added to the efficiency of the Department. There has been evidence of increased and renewed activities in many directions, the results of which may not be immediately apparent but will surely follow.

The chief changes, which will, however, not be reflected in the Estimates until next financial year, consist in the creation of Divisions of Tropical Agriculture and of Botany, the deletion of the Economic Plants Division, and a regrouping of certain Officers and activities in those new Divisions and in the Administrative Branch. Several changes have also been made in the designation of a number of Officers without alteration in their duties or emoluments.

With the appointment of a Deputy Director, the Director who is engaged on legislative duties and special services has been relieved of much detail work. Acting under my general direction the Deputy Director is responsible for the administration of the following sections:—

Tropical Agriculture (including Mazeras and Kibos Experimental Stations), Entomology, Botany (including Mycology), Coffee, Tobacco, Horticulture, Plant Imports, Kabete Experimental Farm, Eldoret Experimental Farm, Library and Museum, Office Stores and Equipment, Seed Distribution, Agricultural Advisory and Extension services, Co-operative Experiments.

Veterinary Services.

Organisation. The unsatisfactory position referred to in my carried on concerning the relationship of Veterinary Services to the organisation of the Department of Agriculture. The agitation was renewed soon after my arrival in Kenya at the instance of Mr. E. Montgomery who had then been appointed Veterinary Adviser to the Uganda Protectorate, and who urged that Veterinary services should be separated from the Department of Agriculture and cease to be under the control of the Director of Agriculture. The matter was referred to a representative meeting of stock owners who with one dissentient passed a resolution expressing the opinion that the Veterinary Department should be

under the control of the Director of Agriculture. A similar motion was passed by Legislative Council, and after the matter had been considered by the Government and the Secretary of State, it was decided that Veterinary services should fall under the Agricultural Department.

Chemical Services.

Orginization. The unsatisfactory position referred to in my last report still obtains so far as the needs of this Department are concerned.

Financial. Statements of Expenditure and Revenue are shown hereunder:—

Expenditure, 1920-21.

Agriculture.

	Amount sanctioned.	Amount spent
	£	£
Administrative Division	16,853	- 21,140
Mycological Division	1,050	- 912
Entomological Division	3,513	- 4,293
Economic Plants Division.		
Including Kibos and Mazeras Farms ...	3,337	- 3,174
Naivasha Stock Farm	7,764	- 9,338
Kabete Experimental Farm ...	4,670	- 4,466
Eldoret Experimental Farm ...	3,675	- 3,692
Miscellaneous.		
Agricultural industries and Development	1,912	- 1,698
Contribution to Imperial Bureau of Mycology	100	- 100
Contribution to Imperial Bureau of Entomology	250	(Not paid).
Grants-in-aid to E.A. Agricultural Societies and Stud Book	900	- 900
Veterinary Division	39,285	- 45,328
Establishment and maintenance of Quarantine Stations	15,075	- 7,447
Pathological Division	30,627	- 27,226
Total Agricultural Department	£129,011	- £129,714

Special Expenditure.

Continuation of Dipping Scheme ...	10,570	- 6,881
Field Laboratory Equipment, Mules and saddlery	1,110	- 492
	£11,680	- £7,373

The excess over amount sanctioned is due chiefly to the increase of expenditure arising out of the revised scale of salaries, which was provided for in a separate Vote for all Departments. The expenditure on the Naivasha Stock Farm includes purchases of breeding stock, the cost of which was covered by additional revenue. The expenditure on the Eldoret Experimental Farm includes £1,500 on the purchase of pure bred stock which are for the present maintained at the Naivasha Farm.

On account of outbreaks of Pleuro-pneumonia and a smaller demand for trade stock, the operations of Quarantine Stations were restricted, and expenditure was reduced. A corresponding reduction is reflected in Revenue under the head of "Testing, Dipping Fees, etc." The balances available under Special Expenditure are carried forward to 1921.

REVENUE, 1920-21.

	£ Revenue estimated.	£ Revenue collected.
Agriculture.		
Sale of farm produce and Stock ...	13,500	14,130
Veterinary.		
Testing, Dipping fees, etc.	30,000	16,016
Pathological.		
Sale of sera, vaccines, etc.	15,750	22,124
	£59,250	£52,270

The Revenue collected is not strictly comparable with Revenue estimated as the estimates were prepared on the basis of Rs. 15 to £1. In the above statement all amounts are shown at Fls. 10 to £1. In certain cases, e.g., sales of stock, purchases were made on a sterling basis with the result that the revenue based on Rs. 15 to £1 was overestimated. Actually a considerable increase in revenue was derived from "Sales of Farm produce and Stock" to meet the increase in expenditure or purchases of breeding stock already referred to.

The decrease in revenue from "Testing, Dipping Fees, etc." was due to restricted activities of quarantine stations as already explained. The increase of revenue under the head "Sera, Vaccines, etc." is largely due to deferred payments by other Governments being made in this financial year.

General. Considerable activity in agricultural development was witnessed in the early part of the year under review. A number of new settlers arrived to take up agricultural holdings, chiefly under the "Discharged Soldiers Settlement Ordinance." Much new capital was introduced into the country estimated at £4,000,000, between March 1920 and February 1921. The effect

of this was to create a sense of prosperity, but unfortunately towards the close of the year depression set in, the influx of fresh capital ceased, primary products could only be sold at greatly reduced prices and in some cases, notably in that of flax, trade had become so stagnated that parcels could not be sold even at low prices. Nor at a time when values had greatly decreased was relief obtained in the high costs of marketing through a reduction in ocean freights, which in several cases represented too high a proportion of the selling price of the product.

The first impression made upon the producer by these reduced values was that in some cases the Colony's chief agricultural products could no longer be produced at a profit. The abnormally high prices which ruled during the war and for some time afterwards created rather false hopes, and were responsible for an outlay in capital expenditure and working costs, which, in the light of subsequent events, were not justified. In some cases, too, land was bought at a price too high to enable it to be made a sound proposition, notably in the case of holdings upon which development had already taken place and which had reached the producing stage. The period of depression will not be without its benefits if it has taught the land holders and managers the lesson of economy. There is already evidence that that result has been achieved, and costs of production have been much reduced. In the end the question of agricultural production in Kenya will resolve itself into whether or no the Colony can compete with other countries on the oversea markets. The advantages which it possesses in respect of soil fertility, favourable climatic conditions, and cheap unskilled labour can only point to the conclusion that in respect of its main crops the European settler can compete favourably with producers in other countries of coffee, sisal, maize, flax and certain oil seeds, provided always that he is not handicapped by railway and ocean freights.

The trade in agricultural exports is for the most part passing through a somewhat difficult, unsatisfactory and it is hoped transient stage. The practice of the producer shipping his own produce directly or indirectly obtains to a degree which is not in the best interests of the agricultural industry. Under these conditions more capital is required or has to be raised to finance the proposition, and the view is held that the settler or farmer should concern himself solely with the production of the primary product and that marketing of it should remain in the hands of those who understand the business. Not until the farmer is able to sell his produce at its full market value, delivered say f.o.r. at his station, and receives payment in cash when the goods are delivered, will the trade be on a satisfactory basis.

The scale of production has hitherto been so limited that firms have not been disposed to establish buying agencies in this Colony, but there is evidence of a movement in this direction, and it may be expected that conditions and facilities offered will improve in the future.

In respect of certain products, e.g., bacon and dairy produce the Colony has recently reached the stage when it has been able to satisfy local demands and there is a small and growing surplus available for export. Here again a difficulty obtains which can only be overcome when the volume of the trade increases and becomes substantial. In the case of dairy products it is desirable that consignments of uniform and reliable quality be exported, but in the absence of central or co-operative butter and cheese factories this cannot be achieved. The bacon industry is in a fair way to establish an export trade as there is a Bacon Factory under management which possesses a thorough knowledge of the requirements of the oversea markets. During this transition period such markets as can be secured in supplies to ships and to ports along the Eastern Coast are being developed, but the demand from these quarters is comparatively small.

Public opinion is ripening and points towards the need of co-operative effort, and the time is not far distant when attention will require to be given to the establishment of co-operative concerns under skilled direction. The scarcity of capital in the hands of those who would become members of a co-operative undertaking prevents progress being made, and there exists a real need for a Land and Agricultural Bank through which, with proper security and safeguards, money could be lent for activities of this sort. If a loan sufficiently large to enable the ordinary facilities of a Land and Agricultural Bank to be afforded to private persons as well as to Co-operative Societies cannot be raised, it is urged that an endeavour should be made to raise a sum sufficient to assist financially such undertakings as creameries (butter and cheese factories), bacon factories, flax grading and baling centres, coffee cleaning and grading mills, wheat flour mills, and the construction of dipping tanks.

In respect of crop yields and quality the farming year under review has varied considerably in different areas of the country. The earlier crop of coffee was abundant and of high quality but on account of dry conditions and tree exhaustion the later crop was light and of low quality. The crop of maize harvested at the end of 1919 and early in 1920 was probably a record one for the Colony. A surplus of 164,000 bags was exported for the year ending June 1920. Unfortunately the yield from the 1920-21 crop in the chief area of European production was low, and the surplus available for export in that year from both European and Native areas was considerably reduced. For the year ending June 1921, 75,000 bags of maize were exported.

Generally throughout the Colony the flax crop was good but in some districts considerable areas suffered from caterpillars. The wheat crop did not suffer as much as in other years from rust and consequently the yield was higher and the quality better than usual. Pastoral conditions were favourable. Stock maintained themselves in good condition throughout the year and excepting for the spread of pleuro-pneumonia the losses from disease were not abnormal.

Agricultural Legislation. The Cleansing of Cattle Ordinance passed its third reading in 1920, but in the absence of funds out of which loans could be granted for the construction of dipping tanks, as provided in the Ordinance, it cannot be put into operation. A Bill dealing in a comprehensive manner with the Grading and Inspection of Agricultural Export Produce has been introduced into Legislative Council. It provides means whereby under differing rules each particular product may, when the need arises, be placed under the operation of the Ordinance.

A Conference of planters was held at the Coast for the purpose of considering what amendments should be made to the Coconut Preservation Ordinance, the Coconut Trade Ordinance, and the Native Liquor Ordinance, all of which were passed in 1915, but never applied. The recommendations have received attention but while the expenditure incurred in applying the "Trade" and "Liquor" Ordinances would be largely covered by the revenue derived therefrom it is estimated that the administration of the "Preservation" Ordinance, from which no revenue is derivable, would cost approximately £4,000 per annum for the first two years, and the necessary funds are not forthcoming.

Attention is being given to a revision of the Diseases of Animals Ordinance of 1906 and 1908, and the rules thereunder. Some co-ordination and consolidation of rules are required and amendments to the Ordinance are indicated in the light of altered conditions since the Ordinance was passed.

Steps are being taken to draft an Agricultural Pests Ordinance, which will deal with the control and eradication of plant diseases and insect pests, also it will provide means for the inspection of nurseries and plantations and consolidate existing legislation provided in the Diseases of Plants Prevention Ordinance and the Regulations thereunder, but which does not cover all requirements. As soon as circumstances appear to be favourable for obtaining sanction for the expenditure which will be incurred it is proposed to submit a Bill for consideration.

Economic Surveys. At the request of the Secretary of State for the Colonies, Economic Surveys were made of the areas covered by the projected new railway lines from Nakuru to Soy and from Thika to Nyeri. The Departmental Committee appointed to deal therewith consisted of the General Manager, Railways the Commissioner of Lands, the Conservator of Forests with the undersigned as Chairman. After taking evidence from persons and Associations possessing a knowledge of local conditions and making an inspection of the districts to be served the Committee presented reports thereon which included estimates of traffic and earnings in three year and ten year periods after the completion of the railways. The issue was one chiefly of agricultural development and it will be realised that the task of offering an opinion and of presenting estimates of probable tonnage of traffic of the different kinds of products which might be produced, presented

no little difficulty. The Committee endeavoured to exercise care in submitting moderate views and estimates. It can hardly be expected that development and production in a country which has not yet got into its stride can be predicted with a degree of accuracy, but in any case it would appear that the economic surveys have established what traffic these new railways may reasonably expect to obtain, and what are the potentialities of these partially developed areas in respect of agricultural wealth and production.

East African Stud Book. The Agricultural and Horticultural Society has undertaken the compilation and publication of a "Stud Book" for the different classes and breeds of pure bred Farm Live Stock. The work is entrusted to a Committee consisting of breeders and Officers of this Department, with the undersigned as Chairman. All applications for entry have to be approved by the Director of Agriculture before being passed for entry. A Grant-in-Aid of £100 per annum is provided on the Vote of the Department to assist in the establishment and maintenance of the Stud Book.

The first volume has been published at a cost for printing alone of £93. Excepting in the case of pigs the number of entries of privately owned stock is disappointing, but although the Stud Book has made but a small beginning its creation is justified as it provides means for maintaining an authentic and permanent record of the pure bred stock in the Colony and their breeding, and its value will be better realised in the future when the numbers may have increased. The numbers of entries of the different classes of stock entered in the first volume are as follows: —

		No. of owners.	No. of animals entered.
Horses.	Thoroughbred	2	2
	Hunter bred	1	1
Donkeys.	Catalonian	1	1
Cattle.	Ayrshire	8	65
	Friesland	21	68
	Hereford	1	3
	Shorthorn	14	46
Sheep.	Suffolk	1	3
Pigs.	Berkshire	8	74
	Gloucester Old Spot ...	1	10
	Large Black	14	93
	Total ...	*72	366

* In a few cases the same person owns more than one pure breed of stock. Particularly in the case of cattle the majority of owners possess bulls only. Fifty-one per cent of the cows and heifers entered are owned by the Department of Agriculture.

Agricultural Census. The Statistical Ordinance of 1918 was applied in respect of agricultural, dairying and pastoral industries, and a Statistical branch of the Department was created. A report on the Agricultural Census of this Colony and Protectorate has been published separately. That report comprises the first authentic record of agricultural statistics for Kenya.

The total area of land available for "European" settlement was 6,060,000 acres on June 30th, 1920. On that date 3,157,400 or 52% of the total was in occupation. Since then there has been a considerable increase in the area occupied.

The total area under cultivation was on that date 176,290 acres, representing 5.58 per cent of land occupied, and 149 acres of cultivated land per occupier. It should be noted that large tracts of land are devoted solely to stock raising. The position as disclosed above appears to be satisfactory in several respects having regard to the stage of development of the Colony.

The total number of European owners, occupiers or managers in occupation of land, and owners of live stock was 1,182 on June 30th, 1920. A number of new "soldier settlers", to whom land was allotted in 1919, is not included. The total number would appear to be small but it should be noted that Partnerships, Syndicates and Companies working one or more holdings, are enumerated singly for purposes of this census.

The area exclusively occupied by Non-Europeans, chiefly consisting of "Native Reserves", is estimated to be 33,651,651 acres in extent.

Further particulars extracted from the Agricultural Census Report in respect of both European and Non-European production and live stock will be found under appropriate heads in this report.

Agricultural Exports. A schedule is given hereunder showing the quantities and values of exports of agricultural products furnished by the Commissioner of Customs. The figures for the last two years are given and for purposes of comparison those for the year immediately preceding the war are included. No useful purpose would be served by taking "war years" as products were not shipped regularly in that period owing to transport difficulties.

Inasmuch as returns of exports have not been kept separately for Uganda and Kenya there is some difficulty in arriving at accurate figures in respect of some products. Imports via Kisumu, i.e., Uganda produce, may be held for a considerable time at the port before shipment, consequently the export figures through Mombasa in the combined return are in some cases less than the imports through Kisumu. It is therefore considered inadvisable to quote figures in the following schedule relating to exports of cotton, cotton seed, and rubber from Kenya.

Comparative Statement Showing Quantity and Approximate Values of Exports Chief Agricultural Products from the Colony and Protectorate of Kenya from July, 1913 to June, 1914, July, 1919 to June, 1920, and July, 1920 to June, 1921.

		Quantity. 1913 - 1914.		Quantity. 1919 - 1920		Quantity. 1920 - 1921.		Value. 1913 - 1914.	Value. 1919 - 20.	Value. 1920 - 1921.
Animals living		No.	9,175	No.	2,855	No.	4,294	£11,838	£4,498	£7,325
Bacon and Ham		Cwts.	9	Cwts.	5	Cwts.	303	56	38	3,438
Butter						Lbs.	150			20
Cheese						Lbs.	1,520			151
Coconuts		No.	160,564	No.	110,420	No.	147,568	610	473	788
Coffee				Cwts.	66,150	Cwts.	127,366	15,694	201,150	464,169
Copra		Cwts.	33,464	Cwts.	28,521	Cwts.	6,245	37,474	35,821	7,499
Cotton				(Figures not available)						
Fibres. Sisal		Cwts.	30,811	Cwts.	87,398	Cwts.	122,559	19,692	117,682	192,830
Flax				Cwts.	8,234	Cwts.	9,129		11,071	14,586
Other sorts		Cwts.	6,798	Cwts.	3,365	Cwts.	6,697	3,959	4,566	10,280
Fibre manufactures				Cwts.	100				273	
Grains. Beans and Peas		Cwts.	27,985	Cwts.	74,578	Cwts.	6,348	10,534	47,551	8,692
Groundnuts		Cwts.	9,546	Cwts.	308	Cwts.	3,439	6,288	357	3,530
Maize		Cwts.	176,646	Cwts.	292,961	Cwts.	134,442	33,102	101,480	47,616
Sorghum & Millet (Mtama)		Cwts.	4,820	Cwts.	9,323	Cwts.	7,979	874	4,100	4,437
Sim-sim		Cwts.	47,604	Cwts.	23,872	Cwts.	28,581	37,356	3,602	30,734
Wheat				Cwts.	812	Cwts.	435		688	494
Chiroco		Cwts.	5,519	Cwts.	8,183	Cwts.	6,053	2,974	7,403	5,241
Other sorts		Cwts.	1,297	Cwts.	898	Cwts.	178	536	531	259
Hides.		Cwts.	2,917,056	Cwts.	32,063	Cwts.	4,087	124,237	42,937	10,038
Oils. Sim-sim		Gals.	8,153	Gals.	3,048	Gals.	6,038	1,168	665	1,677
Potatoes.		Cwts.	39,114	Cwts.	33,558	Cwts.	78,721	6,535	10,472	8,042
Seeds. Flax				Cwts.	2	Cwts.	470		13	581
Other sorts						Cwts.	937			665
Skins. Sheep		Cwts.	1,040	Cwts.	296	Cwts.	202	1,540	505	816
Goats		Cwts.	5,057	Cwts.	8,845	Cwts.	2,995	18,567	54,352	13,288
Tobacco.		Cwts.	54	Cwts.	181	Cwts.	103	97	405	331
Wattle Bark.		Cwts.	3,559	Cwts.	2,906	Cwts.	6,120	1,865	1,951	4,830
Wool.		Cwts.	2,101	Cwts.	3,299	Cwts.	755	9,805	1,693	12,035
						Total Value	...	£344,961	£653,849	£854,747

The very substantial increase in the export of coffee reflects the progress of the coffee industry; the increase in sisal is also noteworthy. The progress of the flax industry is not reflected in these figures as the crop from the increased area in 1920 was not marketed. New features in export returns are the inclusion in 1920-21 of bacon and hams, and dairy produce, and though the quantities and values are comparatively small they indicate the trend of production, which in these cases had first to supply the needs of local consumption.

It will be noted that though the exports of groundnuts and sim-sim in 1920-21 exceed those of 1919-20 they still fall short of pre-war figures. The reduction in respect of copra is not understood, in the case of beans and peas it is due to decline in production brought about by a heavy fall in prices, and the reduction in maize is chiefly due to the lower yield from last season's crop. The stagnation in the "Hides and skins" trade is responsible for the considerable reduction in last year's exports.

The values are not truly comparable one year with another on account of the rise or fall in prices, but in other ways they are of interest.

Land Settlement. During the latter end of 1919 and in 1920 about 400 of those to whom land had been allotted under the "Discharged Soldiers' Settlement Ordinance" occupied their holdings. In addition a number of other persons acquired land by private treaty. The progress of settlement was arrested early in 1921 when depression set in and the value of agricultural products declined so heavily.

The price of land rose in 1920 and in some cases for private reasons or because of its suitability for residential purposes the person acquired the estate or holding at a price above its agricultural value. During the period under review, which was one of depression, there has been no marked decline in the price at which land has been offered for sale, but there has rather been an absence of land transactions. Several important areas are at present far removed from railway facilities and road communications are extremely bad during the rainy season. In those areas land values are at present somewhat unstable, but with the establishment of markets, and the stabilising of prices for farm products and having regard to the fertility of the soil with the favourable climatic conditions a rise in land values may be expected in those areas if and when they are properly served by railways and other communications.

For the most part the "soldier settlers" who have occupied their holdings have taken up the work of development seriously and have made satisfactory progress. Results from the agricultural development of an unimproved holding are nearly always slow and it is most unfortunate that a period of depression and lower market prices should have coincided with their initial effort. Great credit too is due to them for the manner in which they have faced the difficulties, in most cases without previous experience of pioneering work and of farming. The success

which has attended the efforts of the earlier settlers, which when compared with the settlement of other new countries cannot but be regarded as satisfactory, leads one to hope and expect that a substantial proportion of the "soldier settlers" and the other new settlers will eventually succeed, though they have not started operations under the most favourable conditions. In every direction it is seen that increased production from agricultural pursuits is vital to the maintenance and increase of public and transport services and of assured shipping facilities.

Agricultural Show. The Agricultural and Horticultural Society of Kenya held its Annual Show at Nakuru in December, 1920. Except perhaps in the case of cattle the entries of which were restricted on account of Nakuru being in an East Coast Fever area, the Show was thoroughly representative of the agricultural industry. The wide range of agricultural products, varying from those of tropical to temperate regions, was remarkable, and their high quality was proof of suitable environment and soil fertility. The "District exhibits" made in competition for the "Governor's Cup" attracted much interest and focussed attention on the characteristics and productivity of the various districts. Without making invidious distinctions the display of flax and the high quality of several of the exhibits were worthy of special mention. This Department staged exhibits of an educational character and illustrative of its activities, and several members of the staff gave lectures and demonstrations upon different subjects.

Live Stock Industry. Interest has for a few years past chiefly centred around the establishment of a Meat Canning and Freezing Works. Government offered an extensive area of land situated in a good pastoral area, but the conditions were not acceptable to firms engaged in the business. At a later stage when the demand created under war conditions had passed, the terms were revised and made more favourable but all attempts to get firms to interest themselves in the project failed, apparently and chiefly because of the unsatisfactory state of the trade in beef and its products, and the absence of an assured market for the output of the factory. The suitability of large areas of the country for cattle raising cannot be disputed and with the protective measures afforded against stock diseases it is seen that losses can be reduced to a figure which does not seriously hamper stock breeding operations, though it should be mentioned that the cost of inoculations and dipping in order to keep the stock free of disease represents an expenditure of approximately 30s. per head when the animal reaches four years of age. An export trade in meat and its products could only be established in competition with other countries provided the beef is produced at a very low cost. That promises cheap grazing land such as is found in the ranching areas of other countries. In the settled portions of Kenya land has for the most part already reached a value beyond that for ranching, and it possesses a higher value for purposes other than that of beef production.

Excepting restricted areas and areas hitherto undeveloped the position appears to be that the land will eventually be capable of a higher return in production by the growth of different farm crops or in the maintenance of stock other than beef cattle. Such it is submitted is the position in the European settled areas. Over a considerable extent of the native areas cattle also thrive well and under existing conditions little expense is incurred in bringing the animals to maturity. But the value of "native bred" beef is at present low. There is heavy mortality in native owned herds, the needs of the large native population are considerable, and the surplus of animals available for marketing represents a small percentage of the total head of stock. A meat canning and freezing works would provide a market for the surplus cattle both European and native owned and it has been suggested that a stock tax should be levied in order to meet the heavy expenditure which would be involved in extending veterinary services directed towards the eradication of stock diseases. In the absence of an outlet for cattle of the type discussed above it would appear to be impracticable to levy a stock tax. The trade returns indicating the low value of frozen beef, canned meat and meat products point to the probability that, even if a factory or factories were established in this Colony, the prices which could be paid for the stock would be so low that the industry would not be encouraged to develop. In any case the European stock owners would not find the production of beef cattle so profitable as other farming pursuits unless there is a considerable advance in the prices obtained for beef and its products. In view of the position which now obtains in other countries it would appear likely that a Meat Canning and Freezing Works if it had been established two or three years ago would now have ceased operations, owing to stagnation of trade in the beef industry.

Based on the present cattle population of the Colony it is estimated that there might be an annual surplus of about 50,000 head of cattle of different types, additional to the needs for local consumption. If an export trade proved to be a profitable industry the numbers, both in the hands of European and of native owners, would doubtless increase considerably within a few years. The best of the carcases might prove to be suitable for export as frozen beef, and the remainder might be converted into canned meat and meat extracts. Reviewing the position the view is expressed that until such time as a substantial improvement takes place in the world's demand for frozen beef and beef products and prices rise considerably the prospect of establishing a beef industry in this Colony is remote.

The future of the cattle breeding industry has therefore to be considered, and the opinion is held that it lies in the development of the dairying industry. The returns from land devoted to the breeding of dairy cattle and the production of dairy products are much greater than those obtained from its use with "beef" cattle. The pastoral and climatic conditions of extensive areas of the settled portion of the Colony are suited to dairying, but before

the dairying industry can be established along sound lines it is essential that the cattle should be improved in respect of milk production, i.e., that a good type of dairy cattle be bred, and the industry be organised through the establishment of co-operative factories for the manufacture of butter or cheese or both for export. It would therefore appear advisable that European cattle breeders should direct their attention to the breeding of dairy rather than beef cattle. It is true that at the present moment there is a fair demand for beef cattle for local needs, but the volume of the trade is not considerable and the supply is likely to be in excess of the demand at no far distant date. In cases where the cattle breeder is not disposed to carry on dairying on his own farm, or is not favourably situated for that purpose, it may be expected that with a development of the dairying industry he will find a profitable market for cows and heifers of dairy type bred by him.

Sheep breeding whether for wool or mutton production is not likely to be pursued on an extensive scale when compared with certain other countries. The areas suited to sheep are restricted to parts of the Rift Valley and to the plains of West Kenya and Northward into hitherto unsettled portions of the Colony. Experience shows that in most flocks there is a heavy mortality from parasitic diseases and in some seasons blue tongue is a contributory cause. With the facilities now being afforded by the Department in respect of blue tongue vaccine and a specific against parasitic diseases the losses should with good management be considerably reduced.

The demand for horses and mules is so restricted that the breeding of them is not likely to be largely pursued. A limited number of horses will doubtess find a market for racing and sporting purposes and for private use, and the breeding of them will remain an adjunct to other farming operations.

Pig breeding, rearing and fattening has made marked progress during the last two years, due largely to the success attending the activities of the Uplands Bacon Factory. Pigs thrive remarkably well in most parts of the country, and though individual owners occasionally suffer a heavy loss from an outbreak of swine fever, the mortality from disease is in the aggregate not appreciable. Most of the foods necessary for the rearing and fattening of pigs can be produced on the farm at a comparatively low cost and it is considered that the conditions are favourable for the establishment of an export trade in bacon and bacon products. Though it refers to a period shortly after that covered by this report the opportunity may be taken of mentioning that small consignments of bacon and hams have been exported by the Uplands Factory and their quality and suitability for the "home" trade have been favourably commented upon. The export trade however is hampered in respect of cold storage facilities on ships and the factory costs for the manufacture of bacon and its products are heavy. It has consequently been found necessary to

reduce the price of Cts. 25 per lb., live weight hitherto paid. It is satisfactory however to note that the import trade in bacon, etc., has been entirely displaced by the local supplies and that an increasing surplus is available for export.

The total head of stock of different kinds as at June 30th, 1920 was as follows:—

	European owned.	Non-European owned. (estimated).	Total.
Cattle ...	137,604	2,372,037	2,509,641
Horses ...	1,269	71	1,350
Mules ...	996	279	1,275
Donkeys ...	902	31,578	32,480
Camels ...		103,152	103,152
Sheep ...	101,256	2,426,554	2,527,810
Goats ...	2,654	3,576,055	3,578,709
Pigs ...	9,450		9,450
Poultry ...	29,354		29,354

The potential value of the European owned stock is estimated at £1,250,000 and that owned by Non-Europeans as at between £8,000,000 and £9,000,000 or a total value of £10,000,000 approximately.

Main Crops.

Reference has already been made to the general farming conditions for the period under review.

The total acreage in European occupation under cultivation as at June 30th, 1920, was 176,290 acres, and the area under the principal crops was as follows:—

Maize ...	22,109 acres.	Cotton ...	459 acres.
Sisal ...	30,698 „	Wheat ...	4,613 „
Coffee ...	27,813 „	Barley ...	586 „
Flax ...	24,174 „	Oats ...	484 „
Wattle ...	11,565 „	Beans and Peas ...	925 „
Coconuts ...	9,272 „	Potatoes ...	177 „
Sugar Cane ...	691 „	Lucerne ...	342 „
Rubber ...	2,381 „	Fruit ...	2,081 „

Coffee. As at June 30th, 1920 the total area planted was 27,813 acres, of which 9,733 acres were under 3 years, 11,020 acres under 6 years, and 7,060 acres over 6 years of age. The actual yield of "clean" coffee for the year 1919-20 was 71,970 cwts. From statistical information furnished the following average yields have been arrived at:—

Coffee 1 to 3 years of age: ½ cwt. per acre.
Coffee 3 to 6 years of age: 2.86 cwt. per acre.
Coffee 6 years and over: 6.66 cwt. per acre.

There has been a downward tendency in market prices for Coffee of all qualities but provided that the land has not been purchased at an exhorbitant price it is seen that coffee growing is a profitable pursuit. Large areas of the Colony are suited to the culture of Coffee and further extension of the area under cultivation are expected.

With the provision of only one Coffee Officer the Department is wholly unable to give adequate attention to the needs of the industry and the interests of individual planters. Large sums of money would be saved if planters were able to secure the advice necessary for the proper conduct of their operations, and with the great increase in the number of planters it is imperative that additional assistance should be afforded. Apart from other considerations the present staff is unable to properly administer the "Diseases of Plants Prevention Regulations," provided for the inspection of coffee plantations. Reliable information based on accurate data is much needed, and to this end, in so far as the resources of the Department permit, arrangements are being made for experimental work to be undertaken on manuring, methods of pruning, effect of shading and the most suitable varieties of trees for shade purposes. The preparation of coffee for market is also receiving attention with a view to its improvement and efforts should be made to find new markets for the lower grades of coffee.

Flax. The expectation of high prices caused a large increase in the area of flax sown.

As at June 30th, 1920, 24,174 acres were sown with this crop. During the previous twelve months 9,297 acres had been sown and harvested. The average yields per acre from that area were:—

Flax, 1.70 cwt.
Tow, 2.35 cwt.
Linseed, 1.32 bags of 180 lbs.

68 Flax Mills representing 1,274 scutching wheels have been erected to deal with the crop. A great deal of capital has been invested in the flax industry but on account of the depression in the flax trade further progress has been arrested. Many growers have deferred the scutching of the previous season's crop, but with an improvement in trade and the realisation of fair prices interest in the industry will doubtless be revived. Experience shows that the colder and wetter districts are the more suited to flax and indications point to the permanency and extension of the crop in those areas, while in districts where the conditions are less favourable other crops are likely to displace flax. The caterpillar pest already referred to caused serious destruction in some areas, chiefly those at an altitude below 7,000 feet. Ingenuity was displayed by a settler, Mr. Guy, in designing an appliance by which the caterpillars could be caught and removed from the plants in large numbers. Its value to the industry was satisfactorily demonstrated and the designer was rewarded by grants of Fls. 2,000 each from the Flax Association and the Government.

The formation of a representative Flax Association referred to in my last annual report has been accomplished, and among other matters of importance to which it has given attention is the grading of flax. In this connection the Association has been of great assistance to the Department.

Sanction was obtained for the appointment of two additional Flax Officers, and after all the different interests concerned, including the spinners and flax merchants, had been consulted, arrangements were completed for a scheme of flax grading to be put into operation.

There is room for considerable improvement in the growing and handling of flax. To this end efforts are being directed and better results may shortly be expected from greater knowledge, particularly of flax retting and scutching, and an improvement in quality should follow. A considerable reduction in the cost of production of flax is foreseen. On the cost of seed and ocean freights alone the reduction will amount to £60 per ton as compared with that for the past year when both were abnormally high. The marketing of the surplus linseed has engaged attention and provided that cheap railway and ocean freights are obtained and the selling price is not less than 20s. per cwt., it may be found profitable to deseed flax and to export linseed. Experimental work on "Flax" will be dealt with under the Kabete Experiment Farm.

Maize. From an area of 32,167 acres planted and harvested during the year ending June 30th, 1920, the high average yield of 9.87 bags (200 lbs.) per acre was obtained. That yield is probably somewhat above the average for past years as the season was on the whole particularly favourable. The type of maize produced by European growers is almost entirely cross-bred white dent, having as its origin such breeds as Hickory King, Natal White, Horsetooth, and Ladysmith White. The bulk is of high quality falling between grades 1 and 2 on South African export standards. Native grown maize chiefly consists of mixed flint varieties of a quality which would be quite acceptable on the European markets. During the year ending June, 1921 a surplus of 75,000 bags were exported. The development of a maize export trade on a substantial scale is dependent on cheap ocean and railway freights, and on a fair selling price. It is rarely that a season is unfavourable for the production of a good crop and the yield per acre is comparatively high. With the further advantages of soil of high fertility and a low cost of production maize growing may be expected to increase considerably. Great care however requires to be exercised by both growers and shippers to combat weevils, but with proper care and management the difficulties can for the most part be overcome. As soon as it is seen that regular expert trade is likely to be established it is proposed to provide facilities for the Official grading of maize under the Ordinance dealing with the grading and inspection of export products.

The methods of cultivation practised by European growers leaves little to be desired, but the yield of native grown maize could be largely increased with improved methods of cultivation and with a fresh stock of seed. The low yield obtained by them appears to be largely due to weak growth and barrenness of a large proportion of plants. A quantity of pure bred maize of different varieties has been imported from South Africa and distributed for trial purposes among growers throughout the Colony, and it is proposed to secure a considerable quantity of good seed maize for distribution among natives next season.

Through the auspices of this Department about 800 tons of Maize Meal was exported to the order of the Singapore Government. It is satisfactory to note that it was delivered in good condition after its lengthy journey through the heat of the tropics.

Sisal. The total area planted as at June 30th, 1920, was 30,698 acres, of which 16,693 acres was under 3 years of age. Twenty-one sisal factories, with a capacity of 52.5 tons of fibre per diem, have been established. During a period when prices fell considerably production in the factories was restricted but growers have given close attention to reducing costs of production and the industry now seems to be fairly profitable despite the fall in values. The quality of the fibre is high and the chief producers grade the output of their factories.

Wheat. During the year ending June 30th, 1920, 5,614 acres had been harvested, but a further area of 4,613 acres had been sown as at that date. Within the farming year the total area sown with this crop was about 10,000 acres. The average yield from the area harvested was only 6 bushels (loads) per acre, the low yield being due chiefly to "rust" and "drought" which was prevalent in many districts. The succeeding crop harvested during the period under review, but in regard thereto figures are not yet available gave a higher yield. The local production of wheat is short of the present needs for consumption by about 60,000 bags. The difficulty at present is not one primarily of production but of milling. There is only one properly equipped flour mill in the country with a capacity for handling about 10,000 bags of wheat per annum. If more mills were established there is little doubt but that the Colony could in the course of a few years become self supporting in respect of wheat flour. Though the wheat crop is not one naturally suited to much of the settled area there exist large tracts of land where varieties resistant to rust can be grown successfully, and particularly in the case of flax growers a rotation crop of wheat would improve farming practice. The difficulty now experienced by bakers in the use of Kenya flour will it is hoped be overcome as the result of investigations which will be made by the Department in co-operation with the miller and the bakers.

The valuable work previously done by the Department on the raising of rust resistant wheats has lately been resumed on the appointment of a Plant Breeder.

Beans and Peas. The export trade fell off considerably on account of the heavy drop in prices, but with lower costs of marketing attention may again be given to these useful rotation crops. As however their harvesting involves much hand labour they are not suited to cultivation on an extensive scale. The infestation of shipments of beans by the bean beetle has received attention and it is seen that measures can be taken to ensure delivery in a sound condition provided that the beans are kept free of infestation for a month prior to shipment.

Sugar Cane. An area of land extending to 6,000 acres and situated near Kibos has been alienated for the purpose of sugar production, and a mill is about to be erected of a capacity sufficient at least to meet the total needs of the Colony and neighbouring territories in respect of "crystallised" sugar. Subsequent to the closing of returns for the 1920 Agricultural Census a considerable extension has been made in the area of land planted to sugar cane.

Experimental work has been done on varieties of sugar cane, on methods of planting and the Director of Chemical Research has furnished useful information to the industry as the result of analyses of the sucrose content of different varieties at various stages of growth.

Coconuts. As at June 30th, 1920, 421,186 Coconut Palms were planted in European owned plantations. For the most part they had not yet reached the bearing stage but within the next few years there should be a considerable increase in the production of copra. The industry would be stimulated and valuable assistance could be rendered to both European and Non-European interests by the appointment of an Officer who is skilled in coconut culture. The care and management of coconut plantations and the production of copra provide ample scope for work and large sums of money would be saved by those engaged in the industry if the services of such an Officer were available.

Rice. The Chief, Economic Plants Division, has made a survey of rice producing areas along the Coastal belt, and a considerable quantity of seed of the best varieties was procured and distributed among native growers. Attention has also been given to growing the crop in the Meru and Kavirondo districts. The Coastal belt is undoubtedly capable of producing large quantities of rice but as an essential to success irrigation works along the Tana and Sabaki rivers appear to be necessary, and the number of native cultivators would require to be considerably increased probably by the introduction of a tribe or tribes from other parts of the Colony.

Cotton. The high prices ruling for cotton in 1919 and early in 1920 caused some attention to be given to this crop by European farmers and 459 acres had been planted at June 30th, 1920. A considerable extension of the area was also made in the Kavirondo Native Reserve. With a view to testing the different varieties of cotton, among them those suited to the higher

altitudes, a considerable quantity of seed was imported from the United States of America and from South Africa, and it was distributed among growers and experiment stations.

Citrus and other fruits. Fruit growing is receiving comparatively little attention. The demand is restricted to the needs for local consumption and the fruit trade suffers from the same disabilities common to other countries, i.e., the surplus in the hands of growers does not reach the consumer who is ready to buy in greater quantities if the price charged by the retailer were more reasonable.

The manufacture of lemon squash and lime juice was started but unfortunately the enterprise was not successful and operations ceased. Efforts are however being made to manufacture Citric Acid in a concentrated form for export and there is promise that growers of lemons and limes, who are not far distant by road or rail from the factory will find a ready market for these fruits.

Native Agriculture.

It will be understood that native agricultural production can only be estimated. The estimates furnished by District Officers in respect of produce sold by Non-Europeans are as follows:—

Maize	750,000	bags.
Sorghums, Millets, etc. (M'tama)	475,000	bags.
Sim Sim	20,000	bags.
Rice	5,200	bags.
Other Grain	490,000	bags.
Pulse	200,000	bags.
Potatoes	40,000	bags.
Cotton	1,000,000	lbs.
Copra	1,500	cwt.
Bananas	5,000,000	bunches.

The remarkable fertility of the soil of the vast areas comprising the native reserves is evidence of great potential production, and considering that, excluding the pastoral area of fully nine million acres occupied by the Masai tribe, the area reserved for native tribes is approximately four times as great as that in European ownership, viz., 24,280,000 acres and 6,060,000 acres respectively, it will be seen that in order to develop the agricultural resources and wealth of the Colony and Protectorate it is essential that "native agriculture" should be fostered.

Under any circumstances progress must inevitably be comparatively slow among tribes which have so recently come into touch with civilisation and whose methods and outlook cannot be easily changed. To succeed in affecting a substantial improvement in native agricultural practice and in increasing production a large number of instructors will be required. Native instructors are likely to succeed where Europeans would fail, and the cost would be incomparably much smaller with the use of the former, but it will doubtless be found necessary to have European supervisors directing the efforts of the native instructors. The initial step is therefore the training of native agricultural instructors and to this end proposals have been submitted for facilities to be afforded at the Kibos and Mazeras Farms. The scheme provides for a training of two to three years duration after which selected men, who have satisfactorily completed their training, would be posted to the native reserves. There they would manage a demonstration holding devoted to the crops to be grown. From these places as centres of operation seeds would be distributed and the natives in the area around would be taught how to grow the different crops and how to secure better yields than they obtained under their previous methods.

An increase in native production should be directed towards an output of produce which can be exported. Crops such as maize, sorghums and millets, ground nuts, sim-sim, cotton, beans and peas fall under that category while in respect of rice there is large scope for production to satisfy the local demand. Each of these crops is well suited to the resources and facilities of the native, and no question of competition against the European grower should arise.

Doubtless the view is held by some that if natives are encouraged in the manner indicated to develop their own land a sufficient supply of labour for European holdings may not be forthcoming. While the policy to be adopted requires careful consideration and while there is room for differences of opinion, it may be held that by lifting the native out of his lethargy and as a consequence increasing his wants, a proportion of the adult male population will always seek employment elsewhere than in the reserves.

Labour supply. The average number of units of native labour employed monthly on European holdings during the year ending June 30th, 1920 was Men 45,005, Women 3,917, Children 4,787, Total 53,709. Since 1920 labour has become more plentiful and it cannot be said that development has been seriously hindered during the last year by a shortage of labour. For the most part casual labour recruited in the reserves is of an inferior kind and the output of work of these labourers is very low until they have become accustomed to manual labour and have been nourished. An increasing number of natives are remaining in more or less constant employment on farms or work for longer periods than was previously the case, and consequently there is a steady improvement in efficiency.

Veterinary.

The annual reports of the Executive Division and the Division of Veterinary Research disclose the state to which the Live Stock Industry is dependent upon Veterinary services for its maintenance and progress in a country afflicted with so many stock diseases, which in the absence of veterinary control and treatment would cause so heavy a mortality that the industry could not be profitably pursued.

Administrative and Executive Division. During the year all vacant appointments were filled, and six newly appointed Veterinary officers took up duty, but as two Veterinary officers were seconded to vacant posts at the Veterinary Research Laboratory, the Veterinary Department remained short of its full establishment by two units.

The additional appointments enabled certain districts, hitherto unprovided for, to be served with Veterinary officers. Five vacancies among Stock Inspectors were filled by the engagement of men locally appointed.

An important Conference of Veterinary officers from Uganda, Tanganyika and Kenya, convened by this Government, was held in Nairobi. The position in respect particularly of the diseases Bovine Pleuro-pneumonia and Rinderpest was reviewed in a useful and informative report and recommendations were made dealing with their control and eradication. It was estimated that an expenditure of £715,360 spread over a period of three years would be incurred in Kenya if effect were given to the proposals. Before that expenditure be incurred a close examination on the economic side should be made, but it is unfortunately clear that in the existing financial stringency this Colony is unable to bear the cost.

The value of an exchange of opinions and of the joint recommendations submitted by this Conference amply demonstrates the suitability of using such means to co-ordinate veterinary services in adjoining territories.

Outbreaks of Rinderpest on "European" holdings numbered 54, as against 80 in the previous year.

In connection with these outbreaks 7,726 head of cattle were either "double inoculated" or treated with" serum alone."

"Double Inoculation" was systematically carried out in the Nakuru District where 4,363 head of cattle were dealt with. A mortality of .43 per cent. is highly satisfactory, particularly as in this case the cattle were highly susceptible.

An endeavour will be made to have "double inoculation" carried out annually throughout the settled areas. Under existing conditions this is the only method whereby deaths from the disease and outbreaks can be prevented also heavy losses resulting from the inoculation. In the Kikuyu Native Reserve 19,619 head of cattle were double inoculated again with a low mortality, viz., .9%.

A new departure was made in carrying out "double inoculation" against rinderpest and inoculation against Pleuro-pneumonia simultaneously. Apparently the results were entirely satisfactory, and they are of considerable importance as practical difficulties in the inoculation of large numbers of stock are to some extent removed and the cost is reduced.

There is little doubt but that pleuro-pneumonia has spread considerably during the last 2 or 3 years. In most cases the outbreaks were due to the illicit movement of cattle from infected native reserves. These movements are calculated to spread the disease not only in the European settled areas but also in those reserves. Unfortunately the guilt is not confined to the native. Non-European traders and European settlers are not infrequently a party to the illegality, and there is a real practical difficulty in the application of police measures of control. A number of outbreaks were unfortunately traceable to infection from inoculated cattle released from the Kibigori quarantine station. It transpired that a number of cattle in the quarantine station were infected, a condition not suspected, and "clean" cattle became infected during the period covered by the inoculation. Under these circumstances the disease could not be detected in its incipient stage by the injection of vaccine, nor was immunity conferred at this time.

Thirty-six outbreaks were detected in 5 districts in the settled areas, and the disease is believed to exist in 6 of the native reserves.

The number of cattle inoculated during the year against pleuro-pneumonia was:—

1.	On European owned farms ...	27,200
2.	In Native areas	4,500
3.	In Quarantine stations ...	12,342
	Total ...	44,042

With the use of the pure "culture vaccine" now being issued, the mortality has been reduced to about one per thousand.

In connection with the outbreaks 660 head of cattle were slaughtered and compensation amounting to £3,728 was paid under the Diseases of Animals Ordinance. On account of the spread of the disease in which large herds of cattle were involved it became necessary to review the policy to be adopted, as the amount which appeared likely to have to be paid under the compensation clause of the Ordinance would be very considerable. After representative stockowners had been consulted it was decided to discontinue the compulsory slaughter of infected cattle and the payment of compensation but that pleuro-pneumonia vaccine should be issued free and that stock-owners should be encouraged to inoculate their herds in order to protect them against the disease. It was also decided to inoculate free of charge cattle in certain Native Reserves which were believed to be free of the disease in order to protect them against infection.

With the exception of the Northern Frontier District the area of the Colony in which East Coast Fever is not widely spread is comparatively small, and there is reason to believe that those so called "clean areas" are liable to become infected. On European owned farms where dipping and hand-dressing are properly carried out the losses are insignificant, in other cases considerable losses are suffered, and in the native areas where the disease has been endemic for a long period and where the stock acquire immunity, that immunity is only procured with a heavy calf mortality which not infrequently reaches 75 per cent. Until dipping is systematically practised throughout the country and circumstances allow the "Cattle Cleansing Ordinance" to be put into operation, it is feared that little progress can be made against this disease.

Some time must necessarily elapse before dipping can be introduced on an extensive scale in the Native Reserves, and there are certain difficulties to be overcome. With the assistance of District officers a beginning has been made in the dipping of native owned stock, but in a country where cattle immune to East Coast Fever possess a high value some difficulty is likely to be found in persuading the "native" to dip his cattle. In due course they will fail to acquire immunity, but his reward is to be obtained from a much lower calf mortality.

The number of dipping tanks has increased during the yea from 204 to 246. Of these 38 are "Government" tanks, erected chiefly in order to provide facilities for the dipping of transport and trade cattle along the main roads, and to render possible the application of the "Cattle Cleansing Ordinance" to cattle not kept on farms and those absent therefrom for a period beyond that prescribed for dipping. Unfortunately one result of the delay in giving effect to the Ordinance mentioned is that considerable expenditure has been incurred in the construction of dipping tanks which have not yet been put into use.

From figures furnished by the Director of Chemical Research showing that in respect of the strength of the "dipping fluid" no less than 43 per cent of the samples are "seriously" or "dangerously" wrong indicates the need for the exercise of greater care in making up the "dipping fluid." In some cases the error may be partly due to improper sampling, and the matter is further complicated by the oxidation of the arsenite.

There is little change to be recorded in respect of other diseases, particulars of which will be found in the report of the Chief Veterinary Officer attached hereto. In the aggregate they are not responsible for heavy losses, but nevertheless their existence demands care and watchfulness on the part both of the owner and the Veterinary officers.

The Division of Entomology has co-operated with the Veterinary Department in investigating outbreaks of trypanosomiasis.

The importations of cattle, sheep and goats, through the ports of Kilindini and Mombasa, chiefly stock moved from coastal areas for slaughter purposes, shows a considerable increase. The importations of pure bred stock for breeding purposes are small in number and are chiefly made from the United Kingdom and from South Africa.

There has been a decline in the number of "trade stock" passed through the quarantine stations, as compared with the previous year, due chiefly to the paucity of capital for investment in stock. Comparative figures covering the last four years are as follows:—

	1917-18.	1918-19.	1919-20.	1920-21.
Cattle	23,201	19,351	30,102	22,738
Sheep and Goats	6,581	10,441	15,400	6,069
Horses and Mules	450	148	490	1,328

Of these 22,738 head of cattle, 21,617 were double inoculated against rinderpest, 12,342 were inoculated against pleuro-pneumonia and 1,335 against black quarter.

An important service to the community is rendered in the inspection of meat at Nairobi. The abattoir returns for the last 3 years are as follows:—

	1918-19		1919-20		1920-21	
	Nairobi	M'basa	Nairobi	M'basa	Nairobi	M'basa
Cattle	5,567	3,712	7,025	3,232	8,337	3,512
Sheep & Goats	19,930	11,714	23,422	8,325	22,001	8,575
Pigs	427	—	493	—	582	—
Camels	—	36	—	6	—	4

Carcases condemned as being unfit for human consumption represent a very small percentage of the whole. At Nairobi only 80 cattle, 120 sheep and 3 pigs were condemned in 1920-21.

In order to lessen the inconvenience caused to the community through the operation of the permit system governing the movement of stock, the number of honorary permit issuers has been increased from 59 to 104.

There has been a substantial increase in the number of Brands registered and number of branding irons issued. Under the "Resident Natives Ordinance" it is stipulated that "squatters" cattle have to be branded "S". Since that Ordinance was put into force in May, 1920 only 69 "S" brands have been issued, which points to a failure on the part of many stockowners to fulfil the laws.

Research Division. Not until the end of the year under review did circumstances allow two of the vacancies among Research officers to be filled by the appointment (acting) of two officers from the "field staff". The work performed by the Laboratory of Veterinary Research is highly creditable to the Veterinary Pathologist and his staff. Experiments and investigations were undertaken on:—

(1) Rinderpest immunisation.

(2) The utilisation of sheep for supplying virulent blood at centres distant from the Laboratory.

(3) The preparation of pleuro-pneumonia vaccine in bulk.

(4) Immunity conferred by inoculation—Exposure experiment—Pleuro-pneumonia.

(5) Serum diagnosis of pleuro-pneumonia.

(6) The preparation of a vaccine against Anaplasmosis of cattle.

(7) Swine diseases.

(8) Dipping of sheep and goats.

(9) Curative treatment of Ulcerative lymphangitis.

The results of the experiments are summarised in the report of the Veterinary Pathologist attached hereto, and particulars will be published in a separate report.

Evidence of the volume of work of the Veterinary Laboratory and the extent to which the Live Stock industry is dependent upon it for protection against stock diseases is seen in the quantity of sera and vaccines issued during the year which was as follows:—

Anti-rinderpest Serum ...	151,946	doses (about).
Pleuro-pneumonia vaccine ...	103,048	doses
Black quarter vaccine 1st ...	24,170	,,
Black quarter vaccine 2nd ...	24,320	,,
Anthrax 1st	13,320	,,
Anthrax 2nd	13,780	,,
Colon Bacillosis	7,957	,,
Kikuyu Fowl Disease ...	11,980	,,
Ulcerative Lymphangitis ...	1,640	c.cs.
Blue tongue	1,270	doses
Trypanblue (Canine) ...	581	,,
Trypanblue (Bovine) ...	225	,,

A notable advance has been made in the reduction of losses from inoculation against rinderpest and pleuro-pneumonia to a negligible percentage.

The importance of securing a better method than now exists for diagnosing the presence of pleuro-pneumonia cannot be exaggerated, and if the investigations now proceeding should prove successful, some of the difficulties in controlling and eradicating this insiduous disease will be lessened.

On account of the temporary shortage in the supply from local sources of cattle suitable as "serum testers" it became necessary to import about 200 head from Kome Island, but in the absence of an outbreak of rinderpest among the cattle maintained on the Laboratory Farm, an endeavour will be made to meet the needs from animals purchased locally.

Arrangements have been made with the Director of Veterinary Research, Pretoria, to whom an acknowledgement is thankfully given, for certain cattle imported from England to be prepared as "vaccine producers" in order that facilities may be afforded after their arrival here for imported and other cattle to be immunised against red-water and anaplasmosis.

A useful service is rendered in the facilities afforded by the Laboratory for Veterinary Officers to acquire experience in the diseases common to East Africa. A training is also given to stock inspectors and the staff have participated in the course of instructions given to students at the Kabete Experimental Farm.

The number of stock of different kinds which the Institution has to carry in order that it may perform its functions is far beyond that which the Laboratory Farm can maintain. It became necessary to depasture about 600 head of cattle on vacant Crown Land at Londiani, but it is seen that that farm is in some respects inconvenient for the purpose and preliminary steps are being taken to develop an area of about 1,500 acres to serve the following requirements:—

(1) As a quarantine station for imported animals.

(2) As an inoculating station for the immunisation of imported cattle against redwater and anaplasmosis.

(3) As an annexe to the Laboratory farm for the grazing of stock which cannot be maintained there.

Progress has been made in the fittings and equipment of the extension to the Laboratory, but it still remains short of certain buildings essential to its needs. Additional accommodation for staff is also a necessity, and at times the supply of water has been so short as to threaten the continuance of the work.

Entomology.

The staff consists of a Chief of Division with two assistants and a clerical assistant.

A considerable amount of advisory work is conducted by correspondence, and much travelling is done by the staff for the purpose of investigating and in order to carry out trials on control measures, in addition field investigations on the distribution of certain insects engage the attention of Officers.

The Chief attended the Imperial Entomological Conference held in London as representative of Kenya.

The importance of the production of raw silk within the Empire was emphasised and as an outcome silkworm eggs were consigned to Kenya and the cocoons raised will be sent home for valuation and report.

In order to increase the production of beeswax a new type of woven hive has been devised which type natives are encouraged to make and use in preference to the old log type generally seen.

The Division keeps in touch with the South African Locust Bureau reporting on the state of affairs in regard to locusts in these territories, and in return receives all the collated information from the Bureau.

At the Nakuru Show the Division staged a comprehensive exhibit of insects of common importance and a lecture on "Insects affecting stored products" was prepared, copies being distributed

Research Work. Special attention was paid to:—

(i) Insects and stored products.

(ii) Sericulture.

(iii) Flax caterpillars—particularly regarding measures for combating.

(iv) Coconut beetle—trapping experiments, life history.

(v) Insects affecting coffee—parasitising of.

(vi) Garden crop insects—particularly:—

The Diamond-back Moth.

The Bagrada Bug.

The Turnip Saw-fly.

Cutworms.

The Laboratory has been improved by the provision of additional bench accommodation and additional cabinets and shelves. The Library has been augmented and valuable pamphlets have been bound. A catalogue is in course of preparation.

Publications:—

The following papers were published.

(*a*) Flax Caterpillars in Kenya Colony; by F. W. Dry, M. Sc

(*b*) The Red Scale; by F. W. Dry, M. Sc.

(*c*) Egg Parasite of the Coffee Bug; by F. W. Dry, M. Sc.

(*d*) Insects and Stored Products; by T. J. Anderson, M.A., B. Sc.

262 species were added to the Entomological record during the year.

Mycology.

Only one officer was engaged on Mycological work, but provision has been made on the Estimates of the suceeding year for a Division of Botany to be created and for an additional appointment, that of "Chief of Division." In the absence of the Mycologist (Mr. W. J. Dowson) on leave the duties were undertaken by one of the Entomologists (Mr. H. Wilkinson) and on the resignation of Mr. Dowson, Capt. McDonald, M.C., was appointed to the post.

A number of farms were visited to make observations of conditions prevailing where certain diseases were reported and for the purpose of giving advice, these diseases were chiefly among coffee, flax, sisal, cereals, potatoes, fruit and ornamental plants.

Plants and seeds imported into the Colony were also examined for fungoid pests. Investigations were carried out on (1) the treatment of seed affected with flax wilt, and it was demonstrated that treatment with "formalin" could not be made effective; (2) fungus parasitic on flax caterpillars after a series of trials it was concluded that these caterpillars were not being killed as a result of fungoid attack; (3) root disease (*Ustulina zonata*) in certain fruit trees. It is found in old decaying stumps and it was determined as the cause of disease in fruit trees.

The Mycological Laboratory has also undertaken seed testing, and progress has been made in the preparatiaon and mounting of specimens of the fungoid diseases common in the Colony.

Plant Imports. There has been a substantial increase in the quantity and value of imported seeds, trees and plants inspected under the "Diseases of Plants Prevention Ordinance." The figures for the last two years are as follows:—

	No. of packages, etc.	Value.
1919-20 ...	818 ...	£3,712
1920-21 ...	8,352 ...	£43,181

The Plant Import Inspector also rendered useful service by examining and in some cases issuing certificates prior to export in respect of 37,017 bags of grain, coffee, potatoes, ground nuts and cotton seed valued at £47,813. Steps were taken to have appointed to the post of Plant Import Inspector an officer trained in Plant Pathology and Entomology so that, except in cases of doubt it will not be necessary to forward consignments to Nairobi for inspection by the Mycologist and Entomologist.

Naivasha Stock Farm.

In past years this farm has rendered valuable service to the stockbreeding industry by proving the suitability of different breeds of stock to Kenya conditions, by demonstrating the method and value of improving the stock of the country and by supplying pure bred and grade sires to effect that improvement.

Doubtless had the war not arrested progress steps would have been taken to further improve the herds and flocks. The stock breeding industry has reached a stage where if the Naivasha farm is to serve it adequately a considerable improvement will have to be effected in its herds and flocks, particularly on the female side. Towards that end efforts during the year under review have been directed. A large number of female stock have been culled and sold, and as far as financial provision has permitted they have been replaced by pure bred stock. A considerable improvement has consequently been effected in the quality of the stock, and in due time the result should be reflected in the standard of merit of stock offered for sale to breeders.

Attention has been given to tracing the records of breeding of the different animals and those eligible have been entered in the East African Stud Book. A proper system of identification marks has been introduced and pedigrees and other particulars of breeding are being recorded in suitable Herd and Flock Books.

The Manager (Mr. J. H. D. Beales) has rendered valuable assistance in connection with the compilation and editing of the East African Stud Book.

It is satisfactory to note that under the altered system of management of the bulls a much higher calf birth rate is now recorded, and it is evident that opinions previously expressed in regard to certain breeds being unsatisfactory breeders was not due to an inherent defect of the breed.

Arrangements are being made for milk records to be taken of some of the cows of dairy breeds, but facilities do not permit of the work being undertaken on other than a limited scale.

The heavy mortality in sheep due to parasitic diseases has almost entirely disappeared with the use of "Wire worm specific" from the Veterinary Laboratory, Pretoria, and steps have been taken to encourage other sheep farmers to adopt this practice. In order that sheep breeders who have been dependent upon a supply of rams from the Naivasha farm may be able to secure "fresh blood" merino rams have been imported from South Africa and the old rams which have been in use for years will be replaced.

Much needed improvements have been effected on the buildings and fences which had fallen into a bad state of repair, and additions have been made to the equipment of the farm.

Kabete Experiment Farm.

The Staff consisted of the Manager, Assistant Manager, Horticulturist, Flax Officer, Plant Breeder, an Assistant and Clerk. The Manager (Mr. A. J. Wilson) attended to the duties of the Coffee Officer while the latter was absent on leave.

Educational. The second short course of instruction was held in June-July and was attended by 26 students, chiefly drawn from "ex-soldier settlers" who had recently arrived in the Colony. The subjects comprised: Agriculture including special instruction in Coffee and Flax, Stock, Veterinary Science, Agricultural Chemistry, Entomology, Plant diseases, Horticulture, Dairying, Building construction, Medical Hints and Hygiene. Sixty lectures and thirteen demonstrations covering about 86 hours, were given. Valued assistance was rendered by officers of other Departments in making the course complete. Courses of this kind have proved to be of great value to the new settler and also those who have become established on the land, and it is intended to make them a regular feature of the work at Kabete. Apart from their value to the "farmer student" they are advantageous to the work of the Department, as through concourse between staff and "students" the problems and difficulties confronting the man on the land are brought to notice, the ideas of the staff become clarified, and the advice which they are able to give is given with a direct bearing on the needs.

At other times throughout the year the Hostel has been open for the convenience of new settlers arriving in the country and the resources of the farm have been placed at their disposal. In all 87 persons have taken advantage of the facilities offered.

A comprehensive exhibit of an educational character and indicating the results obtained in experiments conducted was staged at the Nakuru Agricultural Show.

Crops and Experiments. The main crops of the farm are flax, wheat, maize and coffee. In all 200 acres are under cultivation. Seed is raised and sold from those varieties which have given the best results in the trials. A quantity of "plant cane" of different varieties of sugar cane have also been issued and steps have been taken to raise fruit trees and nursery plants. Unfortunately the locality and condition of the coffee plantations do not render them suitable for experimental work. From the section of Blue Mountain Coffee, beans are being grown and issued for seed purposes.

Experimental Work. The records of experiments are given in detail in the reports of the Manager and the Flax officer.

Wheat. A large number of different varieties obtained from South Africa together with "Kabete" productions were under trial. Nearly all the South African varieties, including some which possess considerable resistance against "rust" in that country were badly affected by "rust" here; while "Kabete" hybrids and Florence either resisted or escaped that disease. In a trial of many varieties the crop afterbare fallow yielded on an average about 130 lbs. per acre more than after a leguminous crop due to that from the latter having suffered to a great degree from rust. Steps have been taken with a view to produce seed wheat true to name and unmixed.

Variety trials have been conducted on flax, potatoes, beans, peas, maize, sugar cane, the results of which are given in the Manager's report. A rotation experiment of (1) Barley (2) beans (3) maize (4) English Potatoes (5) Teff Grass has been continued. These crops may be grown in both the short and the long rains at Kabete so that the rotation covers two and a half years.

Flax. Careful records have been taken and published of the results obtained from trials upon different varieties and strains obtained from several countries, including the yield and quality and value of the flax tow and seed. Experiments which promise to be of much value have also been conducted upon different methods of retting. A new scutching mill (5 wheels) with a set of breakers was erected and a new flax retting tank was built. The Flax officer stationed at Kabete has been largely engaged on advisory services throughout the country for which purpose he has visited 260 farms and 65 factories. In addition he has given instruction in the handling of flax to the "students" at Kabete and has taught flax scutching to 58 natives, some of whom have been sent from private farms for that purpose.

Horticulture. Considerable improvement has been effected in the condition of the orchard. Additions have been made to the kinds and varieties of fruit grown and in the nursery fruit trees and stocks have been raised. The Horticulturist has toured 26 districts and has visited a large number of farms in an advisory capacity. It cannot however be said that fruit growing is extensively carried on on a commercial scale and in many cases orchards have been found to be in a neglected condition.

Stock. The breeding stock of cattle and sheep consisted almost entirely of grades and cross breds, and in the case of pigs of pure breds but without pedigree. Most of these stock have been sold and there have been established small herds of pure bred Friesland and Ayrshire cattle, transferred from Naivasha farm, and Berkshire and Large Black pigs, chiefly imported from South Africa. In view of the unsuitability of the farm for them, sheep are no longer maintained. These pure bred stock will prove very useful for purposes of instruction and the breeding of dairy cattle will be encouraged and the efforts of the Naivasha farm supplemented. Many of the draught oxen had become too old to be of further use. They have been disposed of and replaced.

Correspondence. About 600 agricultural enquiries have been dealt with and advice and information given.

Revenue. The total amount obtained was £2,570 including £1,870 from the sale of surplus stock.

General. Additions have been made to the equipment of the farm in order that it may be better able to perform its functions and buildings have been adapted to particular requirements, but as an experimental farm it is lacking in many directions and means are not at present forthcoming to provide the facilities necessary.

Eldoret Experiment Farm.

Two holdings in extent 3,510 acres have been reserved for purposes of this farm. Varying types of soil suitable for experimental work and for the growing of the different kinds of crops likely to succeed in the district are represented. The pasture is "sweeter" than on many other farms in the locality and should maintain stock in fair condition for the greater part of the year. The property is bounded by a river with a permanent flow of water, but no water supply has been found for domestic purposes at the higher level of the homestead.

Circumstances prevented operations being commenced until November 1920, when Mr. J. Johnston, formerly Manager at Kabete, was transferred to the managership of the Eldoret farm. Land was cleared for cultivation, a beginning was made in laying out the farm, accommodation of a very temporary kind was erected for the Manager and Foreman, draught oxen, equipment and fencing material were purchased and preparations were made for experimental work to be started.

Tropical Agriculture.

A new appointment of Chief Economic Plants Division, (Mr. T. D. Maitland), was made at the end of the previous year. It was decided to station that officer at Mombasa and to place "Tropical Agriculture" generally under his supervision with a view to the establishment at a later date of a Division of Tropical Agriculture. There therefore fell under his direction duties connected with agriculture along the coastal belt, together with control of the Mazeras and Kibos Experiment Stations. Those activities had in recent years suffered from a lack of supervision owing to war conditions, and it was found necesary to lay out these experiment stations afresh, and to establish a system of crop and experimental records, and to co-ordinate the work at both places. Native grown crops being of primary importance much of the experimental work on these two stations are devoted to their study.

Extension work in Native Reserves.

(*a*) Nyanza Province. In addition to the management of the Kibos farm the Manager undertakes agricultural work in the Kavirondo Province. Under him are three native Agricultural Instructors.

This Province is very extensive and extremely varied in character and in addition is fertile, populated with an industrious people, thus there is very considerable scope for increasing the production of economic crops without endangernig adequate local food supplies. The natives are encouraged to grow rice, sim-sim, ground nuts, maize and cotton.

(*b*) Coastal Region. In view of the large importations of rice annually into the country steps were taken to investigate fully the capacity of the coast for the production of this crop. The limiting factor appears to be the paucity of population coupled with their indigency poverty. An attempt has been made to encourage the growth of the better sorts of rice by the free distribution of seed, but this work only partially meets the case. Each district on the coast has its own rice problem, particularly in reference to the growing period, and the determination of the right types for each district is an essential in the improvement of coastal rice culture.

Sugarcane. Certain areas on the coast are suitable for the cultivation of sugarcane. There are also large areas in the Nyanza Province. A bulletin was published on the cultivation of sugarcane.

Fruits. With a view to securing a comprehensive collection of mangoes, seed has been secured of the various varieties propagated at the coast and introduced at Kibos and Mazeras. A descriptive record of the varieties of fruit has been made.

Copra. A questionaire on the copra industry was circulated to several producers and exporters of copra and the conclusions to be drawn from the answers received indicate that the Coconut Preservation Ordinance will need to be applied before any substantial improvement can be hoped for on the coconut plantations occupied by Non-Europeans.

Mazeras Experiment Station.

The Mazeras farm, which serves the coastal area, has been remodelled, being laid out in divisional sections and plots. These plots are permanent and definitely marked. It is in charge of a Manager, who in addition to experiment work has a considerable amount of advisory and nursery work to carry out.

Attention is being paid chiefly to economic plants for native agriculture. There have been large accessions of varieties of different crops during the year, which when sufficiently propagated will be used in variety trials. It should not be lost sight of that there is a considerable amount of preparatory work to perform before many trials of crops propagated by tubers, suckers and cuttings can be carried out and acclimatisation has to be allowed for.

At present, to mention a few, varieties of muhogo, m'tama, rice, sugarcane, bananas, pineapples, sweet potatoes, tobacco, beans and coconuts are under propagation and trial.

Distribution of plants to natives and public:—

Economic plants	...	820
Economic seeds	...	67 pkts.
Ornamental plants	...	272
Ornamental seeds	...	36 pkts.
Rice ...	...	120 lbs.
Maize ...	...	1,320 lbs.
Kapok ...	...	40 lbs.
Sweet potatoes	...	120 lbs.

Many farmers secure small free issues for experimental purposes from this property, and these distributions are valued.

An interesting exhibit showing careful preparations was staged at the Nakuru Show, comprising starches prepared from muhogo, sweet potatoes and arrowroot; logwood and anatto dyes; various mango fruits; copra, coir; sugar, coco butter, baskets, sticks and other coconut products were exhibited.

The station is at present poorly equipped for carrying on its functions and no proper accommodation is provided for the officer-in-charge. The water supply is also inadequate and in consequence difficulties are created, particularly in connection with the nursery work.

Kibos Experiment Station.

In addition to his duties as Manager the one officer-in-charge of this station supervises native instructors in the Nyanza Province and also trains native agricultural apprentices.

During the season under review weather conditions were unfavourable at Kibos but the higher parts of Kavirondo, owing to better rainfall, produced excellent crops.

The scope of experimental work on the farm is very varied, varying from tropical fruits to native food crops. Much more attention is being paid to the latter and many varieties are under trial prior to recommending generally what to plant. The crops dealt with comprise beans, chillies, maize, rice, groundnuts, cotton, tobacco, sugarcane, coffee and fruits. The scope has been enlarged as it is felt that a more varied form of agricultural work would be adopted by the native.

Groundnuts. Six varieties were under comparative trial. Owing to its taking three years to acclimatise seed reliable results are not yet available.

Maize. Five varieties experimented with.

Tobacco. The best yields of leaf for local Indian markets are Goldfinder, Flannagan and Connecticut seed leaf.

Rice. Many introduced varieties are undergoing comparative trial.

Cotton. The crop appears to do well. A variety trial has been laid down.

Sugarcane. Ten varieties are under trial on the farm, it is hoped to extend the plots and plant out demonstration plots of varieties on private farms.

Distribution of Seed.

Rice. 5,000 lbs. of rice seed was distributed during the year. Conditions were favourable in the reserve for planting.

Groundnuts. 6,000 lbs. of good seed was distributed. In addition sim-sim seed has been issued free to native cultivators.

Cotton. In the case of cotton upon which a considerable amount of time and money was spent the low prices secured by the natives and in many instances the inability to secure any price however low, will react on the cultivation of that crop.

Instruction in Reserve. In the early part of the year three native instructors were employed on cotton work in Kisumu and North Kavirondo. During the latter half of the year their attention was devoted more to the establishment of demonstration plots of groundnuts and rice.

Training of Agricultural Apprentices. There has been established on the farm a lecture room and housing accommodation for young men from the reserve for the purpose of training them in agricultural practice. Natives of a superior type with some education are being selected and, after two years training on the Kibos farm, will if required become native instructors under the Department.

Dairy and Pig Officer. Unfortunately this officer was for a considerable period too ill in health to pursue his duties, nevertheless useful work was done on his visits to many farms throughout the country. Many dairy farmers are greatly in need of advice in regard to problems arising out of the manufacture of butter and cheese. In order to remove the cause of defects it is first necessary to study the conditions peculiar to the country, and the work is hampered in the absence of a Dairy under the control of the Department where investigations can be carried out under proper supervision. The Bacteriological Laboratory (Medical) has rendered useful assistance in the investigation of defects in dairy produce due to bacteria.

At the Nakuru Agricultural Show the demonstrations given on butter and cheese making and on the handling and testing of milk were much appreciated.

Meteorology.

Observations were taken and recorded for 180 "Rainfall Stations" and 21 "Temperature Stations." A Meteorological report for the year 1920 has been compiled and published.

During the year ending March 1921, 40 new railfall stations were spread throughout the country, representing 17 districts. Unfortunately it was only possible, owing to the paucity of the funds available, to equip two of these stations with maximum

and minimum thermometers, but it is hoped, during the ensuing year that important stations, such as Kisumu, Fort Hall and Eldoret, will be equipped with instruments equivalent to a "second order" station.

That increasing interest throughout the Colony in the matter of meteorology is apparent is approved by the numerous applications for instruments, and there are now some 50 to 60 applicants on the waiting list, while twelve of the rainfall stations quoted above are equipped with private guages.

Publications.

The followng bulletins, articles, etc., prepared by officers of the Department have been published during the period under review:—

Annual Report of the Department of Agriculture 1917-18.

Notes on Yellow Tobacco grown from imported American seed; by C. J. Monson. Tobacco Officer. Bulletin No. 5.

Notes on Sugarcane; by T. D. Maitland. Chief Economic Plants Division. Bulletin No. 6.

Poultry; by Hon. Mrs. H. Scott. Poultry Instructress.

Turkeys; by Hon. Mrs. H. Scott. Poultry Instructress.

Kenya a Dairy Country?; by Hon. H. J. Scott. Dairy and Pig Officer.

Flax Grading: Circular 1921.

Interim Report upon the progress of the flax industry in Kenya Colony; by the Director of Agriculture.

Report of a Conference of representatives of the Veterinary Department of Kenya Colony, Uganda Protectorate and Tanganyika Territory: Summary.

Veterinary Services in relation to the organisation of the Department of Agriculture.

Diseases of Plants Prevention Ordinance, 1910. Regulations 1921.

Flax Caterpillars in Kenya Colony; by F. W. Dry, M.Sc. Entomologist.

The Red Scale; by F. W. Dry, M.Sc., Entomologist.

Egg Parasite of the Coffee Bug; by F. W. Dry, M.Sc., Entomologist.

Insects and Stored Products; by T. J. Anderson, M.A., B.Sc. Chief, Division of Entomology.

Flax Scutching: Official report of Nakuru Tests.

Insects: depredations in East Africa; by T. J. Anderson, M.A., B.Sc., Chief, Division of Entomology.

Flax Caterpillars: roping method of dealing with them; by F. W. Dry, M.Sc., Entomologist.

Coconut Beetle: Steps being taken for its destruction; by F. W. Dry, M.Sc., Entomologist.

Inquiry into the life of the Coconut Beetle; by F. W. Dry, M.Sc., Entomologist.

Pleuro-pneumonia contagiosa bovum-lung sickness; by J. Walker. Veterinary Pathologist.

Aids to Stockowners (on common known infectious stock diseases which occur in the Colony); by J. Walker, Veterinary Pathologist, and W. Kearney, 1st Assistant Veterinary Pathologist.

Directions for the use of Anti-Rinderpest Serum, 1921.

Directions for the use of Pleuro-pneumonia (pure culture) Vaccine, 1920.

Directions for the use of Single and Double Blackquarter Vaccine.

Instructions for the use of Bluetongue Vaccine.

Instructions for the use of Trypanblue Solution.

The Construction of Cattle Dipping Tanks.

Cattle Dipping and Tick Eradication.

Submitted with this report are the following appendices:—

Appendix (*a*) Staff as at 31st March, 1921.

(*b*) Annual Report of Acting Chief Veterinary Officer.

(*c*) Annual Report of Veterinary Pathologist.

(*d*) Annual Report of Chief, Division of Entomology.

(*e*) Annual Report of Mycologist.

(*f*) Annual Report of Plant Import Inspector.

(*g*) Annual Report of Manager, Government Stock Farm, Naivasha.

(*h*) Annual Report of Manager, Government Experiment Farm, Kabete.

(*i*) Annual Report of Flax Officer.

(*j*) Annual Report of Horticulturist.

(*k*) Annual Report of Chief, Economic Plants Division.

(*l*) Annual Report of Acting Manager, Government Experiment Farm, Mazeras.

(*m*) Annual Report of Acting Manager, Government Experiment Farm, Kibos.

ALEX. HOLM,

Director of Agriculture.

ANNUAL REPORT

OF THE

Veterinary Department

FOR THE YEAR ENDING

31st March, 1921.

Staff. The Chief Veterinary Officer (Colonel R. J. Stordy, C.B.E., D.S.O.) was absent throughout the whole year having been seconded for duty with the Government of Peru. That arrangement terminated at March 31st, 1921. Mr. W. Kennedy, D.S.O., continued to hold the appointment of Acting Chief Veterinary Officer. Mr. H. H. Brassey Edwards held the appointment of Acting Deputy Chief Veterinary Officer until the return from leave of Lieut.-Colonel A. G. Doherty who was then charged with the duties of that post.

The Office Superintendent and Assistant Accountant served in the capacity of Acting Accountant, Department of Agriculture. Six new appointments were made to the staff of Veterinary Officers, viz: Messrs. J. N. Cooper, S. H. Whitworth, G. B. Purvis, R. L. Creery, Captain W. E. Phipps and Captain R. S. Little. These appointments brought the establishment up to strength, but as Messrs. T. C. Bradshaw and S. H. Whitworth were seconded for duty as Research Officers at the Veterinary Laboratory the field staff remained short of the provision by two units. The following Veterinary Officers were promoted to the Senior Grade with effect from 1st April: Lieut.-Colonel A. G. Doherty, Mr. H. H. Brassey Edwards, Captain O. Dixon, Captain W. W. Henderson, and Captain R. C. Wheeler.

Five vacancies in the staff of Stock Inspectors were filled by temporary engagements made locally.

The death of Veterinary Officer J. Cameron is regretfully recorded after having served the Department well, and the resignation of Captain W. W. Henderson, Veterinary Officer, who has served with ability over a period of 7½ years is a loss to the Department.

Diseases of Cattle.

RINDERPEST. The number of outbreaks of rinderpest which occurred on European-owned farms was fifty-four as against eighty in the previous year. The details of these outbreaks are as follows:—

District.	Number of outbreaks.	Number of cattle involved.	Number of deaths.
(1) Naivasha-Nakuru ...	3	1,100	10
(2) Uasin Gishu-Trans Nzoia	27	2,259	358
(3) Nyeri-Rumuruti ...	4	595	22
(4) Lumbwa ...	11	796	84
(5) Nairobi ...	9	282	49
Total ...	54	5,032	523

In dealing with these outbreaks the "serum alone" method was largely employed owing to the difficulty experienced in supplying fresh virulent blood at short notice but wherever fresh virulent blood was available double inoculations were carried out and altogether 7,726 head of cattle on European farms were dealt with in this way.

Rinderpest was widespread during the year in many of the native reserves particularly those of the Nyanza, Kenya and Ukamba Provinces and the outbreaks on farms were due to extensions of the disease from these areas through, in many cases, the illicit movement of cattle. Buffalo were reported to have died of rinderpest in the Kisii and Trans Nzoia districts and Giraffe in the Trans Nzoia district. In order to safeguard the cattle on farms bordering on the Kikuyu Reserve, Kyambu District, it was decided to actively immunise the cattle in that reserve and with the assistance of the District Commissioner and of the paramount Chief the inoculations were successfully carried out. Altogether 19,619 head of cattle were dealt with and the results of the inoculation were observed by keeping on temperature a certain number of cattle out of each lot done. 994 head were kept under observation for this purpose for periods varying from nine to fourteen days after inoculation and the results were as follows:—

158 Bulls	...	58% reacted
184 Cows	...	36% ,,
225 two year olds		60% ,,
337 yearlings	...	66% ,,
90 Weaners	...	71% ,,
Total 994		

A mortality of .9% occurred in the 19,619 cattle inoculated. The highest mortality recorded in any location was 3.4% and the lowest .6%. No accurate record of the number of abortions caused by the inoculations is available. In some locations the percentage of reactions was considered to be too low and immunity tests were carried out later. These showed that the immunity conferred by the first inoculation was satisfactory.

In January and February a series of double inoculations was carried out on European farms in the Nakuru District. Four thousand three hundred and sixty-three head of cattle were dealt with and 78% of these were high grades and purebreds varying in age from weaners to three year olds. In some herds up to 80% of the cattle gave visible reactions. The deaths following inoculation amounted to .43%.

Double inoculation involves the simultaneous inoculation of a small quantity of virulent rinderpest blood, drawn from an animal suffering from the disease, and of an adequate dose of anti-rinderpest serum: the intention being to produce a mild attack of the disease in the inoculated animal. Practically all the native cattle of the territory carry in their blood the casual organisms of redwater and anaplasmosis and in order to eliminate the risk of infecting cattle, reared on farms where regular dipping is practiced, with these diseases, it has been found necessary to infect the cattle used for virus production either by drenching them with virulent blood or by placing them in contact with an animal which had been infected by inoculation. Infection by drenching has not proved very satisfactory in practice but the "contact method" has been generally successful. In past years, in spite of all precautions, not infrequently cases came under notice where only some of the susceptible cattle reacted within the usual period after inoculation and the balance either failed to react at all or gave "delayed reactions"—the latter occuring up to two months after inoculation. These puzzling results were generally attributed to the administration of excessive doses of protective serum and in order to clear the matter up a series of experiments were conducted at the Veterinary Laboratory. It was thereby clearly established that twice or thrice the usual dose of serum could be administered without interfering with the rinderpest reaction provided freshly drawn virulent blood was used for the inoculation. Experiments were then carried out with blood drawn from infected cattle and kept for varying intervals to ascertain if the virulence of the blood decreased to a noticeable extent. The results showed that blood, kept at room temperature for 24 hours would reproduce the disease when injected into susceptible cattle but when this blood was used in conjunction with large doses of serum reactions were not always produced in susceptible cattle. Another interesting point which was established is that unweaned calves (up to nine months' old) possess a considerable resistance to the disease and may not react to double inoculation. The information obtained from the above experiments has proved of great practical value.

The numbers of cattle double inoculated during the year are as follows:—

On European farms	...	7,726 head
In Native Reserves	...	22,540 ,,
At Quarantine Stations	...	21,553 ,,
Total	...	51,819

PLEURO-PNEUMONIA. The following outbreaks of contagious bovine pleuro-pneumonia occurred on European-owned farms during the year:—

Nakuru-Naivasha District	...	10 outbreaks
Nairobi District ...	...	3 ,,
Uasin Gishu-Trans Nzoia District	...	9 ,,
Lumbwa-Fort Ternan District	...	13 ,,
Nyeri District ...	...	1 ,,
Total	...	36 outbreaks.

In dealing with these outbreaks over 27,000 head of cattle were inoculated against the disease and 660 head were slaughtered.

In the native areas the disease extended into the Siria District of the Masai Reserve, a portion of the Sotik Reserve, the northern portion of the North Kavirondo District and into the Nandi, Kamasia and Uasin Gishu Masai Reserves.

The majority of the outbreaks were due undoubtedly to the illicit movement of cattle from infected native reserves but in one series of outbreaks, involving over 5,000 head of cattle, infection was traceable to contact with infected cattle belonging to a transport company. Cattle smuggling from Uganda and the Masai Reserve was responsible for the spread of infection in the Nyanza Province. Evidence of the disease having spread into the Nyanza Province was first obtained in July when a case came under notice among the cattle in the Veterinary Quarantine Station, Kibigori. Simultaneously an outbreak was discovered in a Masai village in the North Kavirondo District and that district was placed in quarantine. A few months later cases of pleuro-pneumonia occurred on farms amongst cattle which had recently been released from the Kibigori Station and that station was temporarily closed down. It was re-opened in January, but, owing to several cases of the disease coming under notice in cattle recently admitted, it was again closed pending the carrying out of a Veterinary survey of the native reserves of the Province to ascertain the extent of infection. Inoculations were carried out at the infected centres in the North Kavirondo District, in the Siria District, Masai Reserve and in a portion of the Kikuyu

Reserve, Kyambu District. The Veterinary Officer in charge of the inoculations in the Kikuyu Reserve carried out inoculations against rinderpest ("double inoculation") and pleuro-pneumonia simultaneously. The results were very satisfactory. The mortality following inoculation was not more than when the inoculations were carried out separately, the reactions were normal and did not appear to affect one another in any way and a great saving in time was effected.

In dealing with outbreaks in the settled areas prior to January the policy was to slaughter all infected animals and to inoculate all cattle which had been in contact with the infected animals. Compensation was paid for all cattle slaughtered. In January a serious outbreak occurred in the Naivasha District in a herd of about 4,000 head of cattle and involving upwards of 10,000 head altogether. The Government then decided that the compulsory slaughter of infected cattle with payment of compensation could not be continued but that pleuro-pneumonia vaccine should be issued free of charge to stock owners.

When inoculations were first undertaken against pleuro-pneumonia the material used for inoculation was virus either collected from the lungs of naturally infected cattle ("field virus") or collected from calves which had been inoculated with "field virus" behind the shoulder ("calf virus"). The results of inoculation with these materials were not considered to be satisfactory as, in most cases, the reactions could not be controlled and in some cases a heavy mortality occurred. Experiments were then undertaken at the Veterinary Laboratory with artificially cultivated virus and ultimately a vaccine was produced which has been used on a large scale with very satisfactory results—the reactions following inoculation are marked but rarely extend more than a few inches from the seat of inoculation, the mortality rarely exceeds one per thousand and the immunity conferred protects cattle against the subcutaneous inoculation of "field virus."

The number of cattle inoculated during the year was as follows:—

(1)	On European-owned farms ...	27,200
(2)	In Native Areas ...	4,500
(3)	In Quarantine Stations ...	12,342
	Total ...	44,042

At the close of the year pleuro-pneumonia existed on nine European-owned farms and in the following native reserves:—(1) The Masai Reserve, (2) The Suk and Turkana District, (3) The Kamasia and Uasin Gishu Masai Reserves, (4) The Nandi Reserve, and (5) portions of the North Kavirondo and Sotik Reserves.

Veterinary Conference.

Representatives of the Veterinary Departments of the Uganda Protectorate, Kenya Colony and Tanganyika Territory met in Conference in Nairobi in September, 1920. The terms of reference were as follows:—

"To submit recommendations for the control and eradication of the diseases Bovine Pleuro-pneumonia and Rinderpest in which the following should be included and reported upon:—

1. The desirability of joint action on the part of the Governments of the Protectorates of East Africa and Uganda, also Tanganyika and neighbouring territories, and the results to be obtained therefrom.

2. The methods which should be adopted in dealing with these diseases.

3. The requirements in respect of staff, Laboratories, equipment, etc.

4. The payment of compensation for animals destroyed or which may die as the result of inoculation.

5. The cost of giving effect to the recommendations and the period over which the expenditure is likely to be incurred."

The Report of this Conference was forwarded to the Governments concerned on September 27th, 1920.

East Coast Fever.

Upwards of 600 deaths from East Coast Fever were reported during the year and eight outbreaks occurred on farms in the so-called "clean areas." Accurate figures of the losses on European farms are not available as many deaths due to this disease are attributed to other causes, notably "gall-sickness." East Coast Fever is now widely distributed throughout the Masai Reserve, and all the native territories with the exception of the Northern Frontier District, are more or less heavily infected. An outbreak, causing heavy losses, occurred in the Southern portion of the hitherto clean Suk District and it would appear that the infection spread from European-owned farms in the Trans Nzoia District. In July a cow which had been exposed for sale in Naivasha township about three weeks before, died of East Coast Fever at Gilgil. The Gilgil and Naivasha townships were placed in quarantine and no further deaths occurred until the end of November when, through a regrettable error on the part of a Stock Inspector, twenty-four head of infected cattle were permitted to be moved from Londiani to Naivasha. Up to date 82 deaths have occurred.

Wherever systematic dipping and "hand-dressing" have been carried out the disease has soon been got under control. Unfortunately even the European farm area is still inadequately supplied with dipping tanks and, where tanks exist, many stock-owners fail to exercise the necessary supervision over dipping operations. It is doubtful if some of them have even ascertained the capacity of their tanks. The Director of Chemical Research has kindly supplied the following comparative statement with regard to the Analysis of dip samples for the last six years:—

Class.	Error in Strength.	1915	1916	1917	1918	1919	1920
Sufficiently correct ...	Not exceeding 10%	54·5	58·8	52·9	50·1	48·2	46·2
Seriously wrong...	11% to 20%	25·7	22·3	26·1	24·2	25·9	23·7
Dangerously wrong ...	Exceeding 20%	19·8	18·9	21·0	25·7	25 9	30·1
Total number of samples analysed ...				1223	673	873	911

The number of dipping tanks in the Colony is 246 and of these 38 have been erected by Government. The total number of cattle in the Colony is estimated at about three million head of which upwards of 140,000 are owned by Europeans. Comparing this situation with that found in Rhodesia it is found that, in the latter country, there are about 1½ million head of cattle of which over 800,000 head are European-owned and altogether about 1,300,000 head are dipped more or less regularly. The number of dipping tanks in Rhodesia at the end of last year was 1,639.

In August, 1920, the "Cattle Cleansing Ordinance" passed its third reading but, for financial reasons, it has not yet been brought into force since one of the sections provides that it shall not be brought into operation in any area until the Governor shall, under such conditions as he may prescribe by regulation, have made provision for a sum of money out of which advances may be made to owners for the purpose of the construction of dipping tanks.

This Ordinance will make the dipping of cattle compulsory and until it is promulgated it is feared that little headway will be made in the eradication of East Coast Fever and other tick-borne diseases.

A few cases of arsenical poisoning in cattle caused by the careless disposal of dipping materials came under notice during the year.

780 head of cattle were tested for immunity to East Coast Fever and 733 of these survived the test.

Trypanosomiasis.

One outbreak of trypanosomiasis which occurred at Kericho towards the end of last year was stamped out by the slaughter of all infected cattle on the farm. An outbreak occurred on a farm in Songhor district during the year amongst cattle which had been recently imported from Tanganyika Territory and several cases came under notice in cattle and donkeys from the Northern Frontier District.

Foot and Mouth Disease.

Twenty-one outbreaks of Foot and Mouth disease came under notice during the year as compared with thirty-seven last year. Of these twenty-one outbreaks, two occurred in quarantine stations amongst cattle drawn from native reserves, thirteen occurred on farms in the Uasin Gishu-Trans Nzoia district, one occurred in the Songhor district, and five occurred on farms in the Nakuru district. The Uasin Gishu and Songhor outbreaks were traceable to contact with cattle which had been released from a quarantine station where the disease was subsequently found to exist and the Nakuru outbreaks were thought to be due to infection contracted from native sheep and goats. Few deaths occurred from this disease.

Anthrax.

The following outbreaks of Anthrax were reported during the year and the diagnosis confirmed by microscopical examination:—

Nairobi District	...	6 outbreaks.
Nakuru-Naivasha District	...	11 ,,
Lumbwa District	...	1 outbreak.
	Total	18 outbreaks.

In the majority of these outbreaks all the cattle involved were vaccinated without delay and the results were very satisfactory. In one outbreak nine deaths had occurred before anthrax was suspected and six natives contracted the disease through eating the flesh of some of these cattle but, happily, they all recovered.

Heartwater.

Only one outbreak of Heartwater came under notice during the period under review. It would appear, however, that this disease is fairly widespread in the Colony but is rarely diagnosed owing to the small mortality resulting and to its confusion with other diseases.

Contagious Abortion.

Of nineteen blood samples received at the Laboratory for examination during the year seventeen proved to be positive to contagious abortion and two were doubtful. No serious losses from this disease were brought to the notice of the Department.

Blackquarter.

Sixteen outbreaks of Blackquarter came under notice during the year. In all cases vaccination against the disease was carried out with uniformly successful results. On many farms annual vaccination of all susceptible cattle is now carried out as a routine practice.

Anaplasmosis.

This disease was the cause of a heavy mortality on some farms particularly amongst calves of from three to six months old.

Colon Bacillosis and Bacillary Necrosis.

These diseases were responsible for considerable losses amongst calves particularly on dairy farms where the cows were heavily milked. The former was controlled to a considerable extent by vaccination but it was generally found that unless the calves were well fed little could be done in the way of treatment in the case of the latter.

Diseases of Equines.

Horse sickness. Upwards of fifty deaths occurred during the months of January to June from horse sickness.

Ulcerative Lymphangitis. Seventy-seven cases of Ulcerative Lymphangitis in horses and mules came under notice as compared with 136 last year. More than half the cases reported this year occurred in the months of April, May and June.

Epizootic Lymphangitis. Altogether 18 cases of Epizootic Lymphangitis came under notice.

Anthrax. Two cases occurred in mules.

Biliary Fever. Several cases of Biliary Fever were diagnosed in military donkeys working in the Northern Frontier District.

Diseases of Sheep and Goats.

"Wireworm" and "Sheep-scab" (Mange) are the two scourges which menace the sheep industry in this Colony. "Scab" can be eradicated from a flock by careful and systematic dipping but few farmers devote the necessary amount of attention to this important operation to render it successful. Owing to the fall in the price of wool one or two farmers have not hesitated to shear their sheep, as soon as this disease was detected in their flocks, in order to eradicate the disease more rapidly.

In regard to "Wireworm," the remedy issued by the Veterinary Research Division of the Union of South Africa has given such successful results at the Government farm, Naivasha, that arrangements are being made to produce ample supplies locally for the sheep farmers of the Colony.

Diseases of Pigs.

Six outbreaks of Swine Fever came under notice during the year in the Nakuru and Lumbwa districts. The mortality, as usual, was extremely heavy. No method of immunization against this disease has yet been discovered.

Diseases of Poultry.

Fifteen outbreaks of co-called "Kikuyu Fowl Disease" came under notice. From reports received the vaccine issued by the Veterinary Pathological Laboratory has continued to give excellent results when used as a preventive.

Livestock Importations.

The livestock importations through the ports of Kilindini and Mombasa for the years 1918-19, 1919-20 and 1920-21 were as follows:—

	1918-19	1919-20	1920-21
Horses ...	8	84	41
Mules ...	51	5	20
Donkeys ...	383	183	78
Cattle ...	872	840	1342
Camels ...	88	24	29
Sheep and Goats ...	1870	2445	5652
Pigs ...	9	39	93
Poultry ...	116	339	582
Dogs ...	25	60	152
Cats ...	4	8	5
Monkeys ...	—	—	1
Guinea Pigs ...	—	—	4
Birds ...	—	—	8
Lion Cubs ...	—	—	2

Analysis of Importations, 1920-21.

	United Kingdom.	South Africa.	India.	Tanganyika Territory.	Zanzibar.	Jubaland and Italian Somaliland.	Seychelles.	Arabia.	Italy.	Australia.
Horses ...	5	28	1	1	1	5	—	—	—	—
Mules ...	—	2	—	—	—	18	—	—	—	—
Donkeys ...	—	—	—	40	1	37	—	—	—	—
Cattle ...	23	77	—	—	—	1175	—	64	—	3
Camels ...	—	—	—	—	—	29	—	—	—	—
Sheep ...	12	67	—	—	—	2	—	9	—	5
Goats ...	1	1	1	—	—	5541	—	13	—	—
Pigs ...	63	22	—	—	—	—	—	8	—	—
Poultry ...	409	110	6	17	—	26	11	3	—	—
Dogs ...	83	49	9	6	—	2	1	—	2	6
Cats ...	3	—	1	—	1	—	—	—	—	—
Monkeys ...	—	—	—	—	1	—	—	—	—	—
Guinea Pigs ...	4	—	—	—	—	—	—	—	—	—
Birds ...	4	—	—	—	4	—	—	—	—	—
	(Pigeons)				(Parrots)					
Lion Cubs ...	—	2	—	—	—	—	—	—	—	—

Trade Stock. The following returns show the number of trade stock dealt with at the various quarantine stations during the year:—

	Cattle.	*Sheep.*	*Ponies and Mules.*
Kibigori ...	9,308	—	—
Isiolo ...	4,422	6,069	1,328
Kamakoiwa ...	2,675	—	—
Machakos ...	1,529	—	—
Waterfalls and Thika ...	2,047	—	—
Athi River ...	1,636	—	—
Kipkarren ...	977	—	—
Kamarin ...	144	—	—
Total ...	22,738	6,069	1,328

Of the cattle which passed through the above quarantine stations 21,617 were double inoculated against Rinderpest, 12,342 were inoculated against Pleuro-pneumonia, and 1,335 were inoculated agaisst Blackquarter.

The cost of maintaining the above-mentioned quarantine stations was £7,447 and the revenue derived from these amounted to £9,196.

Meat Inspection. The following abattoir returns have been received from Nairobi and Mombasa and the returns for the previous two years are given for purposes of comparison:—

1. *Nairobi.*	1918-19.	1919-20.	1920-21.
Cattle slaughtered ...	5,567 ...	7,025 ...	8,337
Sheep and Goats slaughtered ...	19,930 ...	23,422 ...	22,061
Pigs slaughtered ...	427 ...	493 ...	582

The numbers condemned as unfit for human consumption were 80 cattle, 120 sheep and goats and 3 pigs.

These carcases were condemned for the following reasons.:—

Cattle.

East Coast Fever ...	14
Measles	51
Pleurisy	6
Jaundice ...	1
Gall Sickness ...	1
Pleuro-pneumonia ...	6
Poison	1
	80

Sheep and Goats.

Pleuro-pneumonia ...	25
Dysentery ...	1
Emaciation ...	82
Jaundice ...	6
Pleurisy ...	6
	120

Pigs.

Suspected Swine Fever	1
Pneumonia ...	1
Pleurisy ...	1
	3

2. *Mombasa.*	1918-19.	1919-20.	1920-21.
Cattle slaughtered ...	3,712	3,232	3,512
Sheep and Goats slaughtered ...	11,714	8,325	8,575
Camels slaughtered ...	36	6	4

THE PERMIT SYSTEM.

The movement of livestock throughout the Protectorate, except within the boundaries of the native reserves, continues to be governed by the permit system. The only complaint raised by European stock-owners with regard to this system was the difficulty sometimes experienced in obtaining permits owing to the distance they had to send for them. The number of honorary permit issuers was considerably increased in order to remove this ground for complaint and there are now 104 honorary permit issuers as compared with fifty-nine last year. The thanks of the Department and of the community at large are due to these gentlemen for having accepted their appointments.

Branding of Stock Ordinance.

The following are the particulars of brands registered, transferred and cancelled during the year:—

Brands registered ...	164
Brands transferred ...	4
Brands cancelled ...	3

The following branding irons were issued:—

To Government Departments	179
To private individuals ...	234
To the Uganda Protectorate	29
Total ...	442

In addition to the above 17 sets of numeral brands were issued.

Resident Natives Ordinance: Issues of "S" branding irons for the purpose of branding "squatters'" cattle under this Ordinance were commenced on 5th May, 1920 and since that date 69 branding irons have been issued.

Correspondence.

6,226 inward and 5,179 outward communications and memoranda were dealt with during the year. The latter figure does not include letters or memoranda of which more than one copy was required for circulation purposes.

W. KENNEDY,

Acting Chief Veterinary Officer.

APPENDIX C.

ANNUAL REPORT

OF THE

Division of Veterinary Pathology, Kabete,

FOR THE YEAR ENDED

31st March, 1921.

TO THE HON. THE DIRECTOR OF AGRICULTURE,

through

THE AG. CHIEF VETERINARY OFFICER, NAIROBI.

I have the honour to submit the following Report upon the work of this Division for the above-mentioned period.

Staff. Difficulties were experienced in carrying on the activities of this institution owing to the shortage of staff and the absence of a number of Officers on leave, but towards the end of the period under review the staff was strengthened by the transfer of Veterinary Officers T. C. Bradshaw and S. H. Whitworth to the Laboratory staff as Veterinary Research Officers.

2 *Course of Instruction to*

(*a*) Veterinary Field Officers.

(*b*) Stock Inspectors.

(*c*) Settlers and others.

During the past twelve months several Veterinary Field Officers have taken advantage of the short course of instruction which is given by the Professional Officers of the Laboratory. It is pleasing to remark, in connection with this, that Veterinary Officers en route to Uganda have spent a short time here, also.

Similarly, these Officers and Gentlemen appearing under (*b*) and (*c*) above have also attended at the Laboratory.

3. *Livestock.*

Species.	On Books 31st March, 1920.	Received during the year.	Total for year.	Remaining on Books 31st March, 1921.
Horses ...	18	35	53	16
Mules ...	65	9	74	51
Donkeys ...	Nil	6	6	6
Cattle ..	1,017	1,023	2,040	1,222
Sheep ...	98	118	216	105
Goats ...	6	17	23	17
Pigs ...	16	26	42	18
Totals ...	1,220	1,234	2,454	1,435

4. *Correspondence.*

5,849 Inward and 5,300 Outward papers were dealt with during the year—a total of 11,149. This does not include confirmation of telegrams or the numerous letters and papers sent to the Laboratory by the Veterinary and other Departments for noting and return.

Apart from the letters of a technical nature, a considerable number of Reports, the preparation of Pamphlets, Instructions for the use of Vaccines, and Sera, received my personal attention.

5. *Laboratory Farm Work.*

Approximately, 150 acres were under cultivation during the year. The following crops were grown for animal feeding purposes:—

Rape.
Carrots.
Mangolds.
Oat Hay.
Barley Hay.
Green Oats.
Green Lucerne.
Bean Forage.
Green Maize.
Horse Beans.
Peas.
Maize Grain.

Some 700 tons of Ensilage were prepared during the period under review.

Our present acreage is insufficient to produce all the foodstuffs required and it was, therefore, found necessary to purchase from outside sources, foodstuffs to the value of £1,887.

6. *Buildings and Land.*

No buildings were erected during 1920-21 and it was found increasingly difficult to house the Laboratory Staff.

Besides housing accommodation for the Staff, the following are still required:—

(1). Housing accommodation for Rinderpest Serum Cattle.

(2). Pig Styes for Swine Fever experiments.

(3). Isolation building.

(4). Erection of an Incinerator.

(5). Drainage of Laboratory Buildings and Post-mortem house.

7. *Laboratory Plant.*

The Laboratory Plant is too small for our present requirements and needs extending. Owing to this and to the precarious condition of our water supply, the continuance of the production of sera and vaccines was threatened.

8. *Finance.*

The total sanctioned expenditure for this Division during 1920-21 was £30,627. Of this amount, £27,226 was actually spent, including £11,639 for Personal Emoluments, and the balance being for the production of Anti Rinderpest Serum, Purchase of Apparatus, Machinery and Animals and for the general upkeep of the Laboratory.

The total revenue derived from the sale of Laboratory Products amounted to £22,124, exclusive of revenue derived from Anti Rinderpest Serum used in connection with inoculations by the Veterinary Division in the Field. This latter revenue is included in the Veterinary Division books under the sub-head "Testing, Dipping Fees, etc."

9. Technical Work.

Routine. (*a*) Examination of Smears and Specimens.

(*b*) Preparation of Sera and Vaccines.

(*a*) Examination. A total of 2,796 Slides and Specimens received from Government Officials and Stock-Owners were examined and reported on during the Year.

The following is a classification of the diagnosis arrived at:—

CATTLE, TOTAL EXAMINED		2,263
East Coast Fever	514	
Suspicious East Coast Fever	25	
Redwater	21	
Redwater and East Coast Fever ...	4	
Redwater and Anaplasmosis	2	
Anaplasmosis	16	
Anthrax	29	
Blackquarter	8	
Trypanosomiasis	21	
Small Piroplasms	12	
Worms	1	
Ticks	1	
Anaemia	1	
Bacillary Necrosis	3	
Suspicious Colon Bacillosis	1	
Gastritis	1	
Hyperaemia and Oedema of Lungs ...	1	
Spirochaetosis	3	
Gastritis and Enteritis	1	
Arsenical poisoning	4	
Wireworm	1	
Haematoma in Lumbar region ...	1	
Suspicious Anaplasmosis	1	
Cirrhosis of Liver	1	
Enteritis	1	
Haemorrhagic cystitis	1	
Necrosis	1	
Pneumonia	2	
Contagious Abortion	17	
Suspicious Blackquarter	6	
Haematuria	1	
Pleuro-pneumonia	22	
Pleurisy and Pneumonia	1	
Doubtful Contagious Abortion	2	
Suspicious Anthrax	1	
Awaiting diagnosis	29	
Negatives	1506	
HORSES, TOTAL EXAMINED		184
Ulcerative Lymphangitis	60	
Suspicious Ulcerative Lymphangitis ...	6	
Epizootic Lymphangitis	7	
Anthrax	2	
Suspicious Streptothricosis	1	
Worm infection (Sclerostomes) ...	2	
Streptococci	1	
Awaiting diagnosis	3	
Negatives	102	

Mules, Total Examined		73
Ulcerative Lymphangitis	17	
Suspicious Ulcerative Lymphangitis ...	4	
Epizootic Lymphangitis	11	
Trypanosomiasis	1	
Micrococci	1	
Worm infection (Gastrophile)	1	
Awaiting diagnosis	1	
Negatives	37	
Donkeys, Total Examined		43
Piroplasmosis and Trypanosomiasis ...	1	
Biliary Fever	15	
Awaiting diagnosis	1	
Negatives	26	
Sheep, Total Examined		22
Perforation of Colon	1	
Awaiting diagnosis	4	
Negatives	17	
Goats, Total Examined		2
Awaiting diagnosis	1	
Negatives	1	
Pigs, Total Examined		31
Anthrax	1	
Anaemia, Gastro-enteritis, Helminthiasis ...	1	
Necrotic abscess in Jaw	1	
Inflammation of Stomach & Congestion of Lungs	1	
Negatives	27	
Dogs, Total Examined		38
Sarcoma	1	
Tick Fever	19	
Anaemia	2	
Awaiting diagnosis	1	
Negatives	15	
Jackals, Total Examined		
Negatives	1	
Giraffes, Total Examined		2
Negatives	2	

CATS, TOTAL EXAMINED		4
Spirochaetes	1	
Awaiting diagnosis	1	
Negatives	2	
TURKEYS, TOTAL EXAMINED		13
Kikuyu Fowl Disease	3	
Egg Bound	2	
Peritonitis	1	
Indications of poison	2	
Too decomposed	1	
Negatives	4	
DUCKS, TOTAL EXAMINED		5
Enteritis	1	
General Peritonitis	1	
Awaiting diagnosis	2	
Negatives	1	
FOWLS, TOTAL EXAMINED		112
Kikuyu Fowl Disease	55	
Poverty	3	
Tapeworm infection	2	
Sarcoma and Pericarditis	1	
Pericarditis and Peritonitis	1	
Sarcoma of Liver	1	
Parasitic infection	1	
Enteritis	1	
Acute Peritonitis	2	
Internal Haemorrhage and Parasitic Pneumonia	1	
Pneumonia	1	
Spleen rupture	1	
Accidental death	2	
Egg Bound	6	
Diptheritic Roup	2	
Distension of Yolk Sac	1	
Peritonitis	2	
Haemorrhage of neck	1	
Negatives	29	
TICKS, TOTAL EXAMINED		1
Awaiting diagnosis	1	
FLIES, TOTAL EXAMINED		3
Haematopota hirta	1	
G. *Longipennis*	2	

(b) Preparation of Sera and Vaccines.

The following Table shews the Laboratory Products prepared during the year:—

	Balance on hand 31st March, 1920.	Prepared during Year.	Issued.	Balance on hand 31st March, 1921.
Anti Rinderpest Serum	1,863,930 c.cs.	8,220,250 * 99,630	7,597,300	2,586,510 *Returned to Store.
Blackquarter Vaccine, 1st ...	1,300 doses	23,770	24,170	900
do. 2nd ...	1,300 „	23,920	24,320	900
Trypanblue, (Canine)	222 „ * 12	752	581	405 * Returned to Store.
do. (Bovine)	2 „	230	225	7
Colon Bacillosis ...	437 „	7,539	7,957	19
Kikuyu Fowl Disease	—	11,980	11,980	—
Ulcerative Lymphangitis	55 c.cs.	2,195	1,640	610
Anthrax, 1st ...	8,830 doses	9,720	13,220	5,330
do. 2nd ...	10,330 „	8,920	13,780	5,470
Pleuro-pneumonia ...	—	103,048	103,048	—
Bluetongue ...	—	1,270	1,270	—

Details of the Issues are as follows:—

	Stockowners.	Other countries.	Departmental.	
Anti Rinderpest Serum	190,970	3,934,580	3,471,750	7,597,300 c.cs
Blackquarter 1st ...	17,2 0	1,000	5,890	24,170 doses
do. 2nd ...	17,430	1,000	5,890	24,320 „
Trypanblue (Canine)	166	—	415	581 „
do. (Bovine)	64	—	161	225 „
Colon Bacillosis ...	7,108	—	849	7,957 „
Kikuyu Fowl Disease	11,740	—	240	11,980 „
Ulcerative Lymphangitis	1,040	—	600	1,640 c.cs.
Anthrax, 1st ...	7,680	—	5,540	13,220 doses
do. 2nd ...	8,530	—	5,250	13,780 „
Pleuro-pneumonia ...	22 191	2,000	78,857	103,048 „
Bluetongue ...	170	—	1,100	1,270 „

In spite of the difficulties encountered, owing to the number of Officers absent on leave which necessitated the re-organisation of the work, more particularly the Clerical Staff, the hearty co-operation of all members of the Laboratory staff in the execution of their duties, enables me to place on record this small token of appreciation.

The shortage of Professional Officers necessitated the Veterinary Pathologist controlling and supervising a portion of the Technical Routine Work of the Laboratory, e.g., the preparation, issue and testing of the following:—

(1) Rinderpest Serum and Virulent Blood.

(2) Pleuro-pneumonia vaccine.

(3) Anthrax vaccine.

(4) Bluetongue vaccine.

The following was also dealt with,

(1) Technical correspondence.

(2) Publication of Pamphlets, Bulletins and "Directions for use" of some of the Vaccines and Serum.

(3) Other duties of a Technical Routine nature.

(4) Visits to various Estates in the Colony, in connection with Stock Diseases investigations.

The Programme of Research Work had thus to be curtailed.

Experiments in connection with the following were carried out, viz,

(1) Rinderpest immunisation.

(2) The utilisation of Sheep for supplying Virulent Blood at Centres distant from the Laboratory.

(3) The preparation of Pleuro-pneumonia vaccine in bulk.

(4) Immunity conferred by inoculation—Exposure experiment—(Pleuro-pneumonia).

(5) Serum diagnosis of Pleuro-pneumonia.

(6) The preparation of a vaccine against Anaplasmosis of cattle.

(7) Swine diseases.

(8) Dipping of Sheep and Goats.

(9) Curative treatment of Ulcerative Lymphangitis.

A summary of the Experiments and Results is now given.

It is proposed to publish these in detail, later.

Preparation of Anti Rinderpest Serum and Vaccines.

1. *Anti Rinderpest Serum and Virulent Blood.*

Supplies of Cattle for Rinderpest Serum making.

The average Monthly output of Rinderpest serum is, approximately, 10,000 units of 50 c.c's.

To produce this the following cattle are required:—

(1) Virus makers, approximately, 25 head of susceptible cattle, 1-1½ years old, per month.

(2) Serum Makers, approximately, 120 head.

(3) Serum Testers, approximately, 9 head of susceptible cattle per month.

Virus Makers.

So far no difficulty has been experienced in obtaining, locally, sufficient susceptible cattle for this purpose and it is anticipated, provided arrangements are made to purchase in areas prior to Double Inoculations being carried out, the required number of these animals should be obtainable.

Serum Makers.

These include various breeds of cattle such as Uganda, Grade and Native of various ages.

Hitherto, the majority of the herd of Serum Makers comprised Uganda cattle but, since supplies from this source are not now available, and deficiency caused by death or other cause is now made up with Grade or other cattle which are drafted into the herd after being used for serum testing purposes.

It is not anticipated that any difficulty will be experienced in maintaining the herd at the strength required viz, approximately, 120 head.

Serum Testers.

Hitherto, supplies of serum testers were also obtained from Uganda.

Cattle for this purpose must be highly susceptible and as this type was not obtainable locally arrangements were made for the purchase of 200 head of suitable cattle from Kome Island in the southern portion of Lake Victoria.

They are very susceptible to Rinderpest but immune to East Coast Fever, Redwater and Anaplasmosis.

The inoculation of dogs with blood of several Kome Island cattle to determine the existence of Trypanosomiasis gave negative results.

Blood smears collected from these animals, when undergoing Rinderpest Immunisation, were negative for Trypanosomiasis.

The existence of a Trypanosome morphologically resembling Trypanosoma Theileri has been recently noted and up to the time of writing three of these animals have been found affected.

Experiments are now being carried out to ascertain whether this Trypanosome is of Pathogenic importance.

A feature of the Rinderpest Immunisation of Kome Island cattle is the large percentage of breakdowns in immunity to P. bigeminum infection which occurs consequent on the Rinderpest reaction.

It is proposed to utilise susceptible Grade cattle purchased locally for serum testing purposes when the supply, on hand, of the Kome Island cattle is exhausted.

2. *Pleuro-pneumonia Virus and Pure Culture Vaccine.*

Supplies of Pleuro-pneumonia vaccine sufficient to meet all demands were maintained.

The number of doses issued amounted to a total of 103,000, approximately, 3,529 of this being virus, the remainder pure culture vaccine.

The results in the Field show that the use of the virus is unsatisfactory inasmuch as there is a difficulty in controlling the reaction and a mortality ensued.

The issue of virus was consequently abandoned.

Little or no mortality resulted from the use of the pure culture vaccine and the loss of tails was insignificant.

Amended directions for the use of pure culture vaccine were issued.

3. *Anthrax.*

Supplies of Anthrax vaccine (Pasteur method) were prepared to meet all demands; the results in the Practice have been satisfactory.

A few break-downs have been recorded and the Owners were advised to re-inoculate with a double dose of the second vaccine only, with satisfactory results.

4. *Bluetongue Vaccine.*

A supply of Bluetongue vaccine was prepared and issued. Supplies can now be prepared to meet local demands.

Besides the preparation of Blackquarter, B.coli, Kikuyu Fowl Disease and Ulcerative Lymphangitis vaccines, experiments were carried out by the 1st Assistant Veterinary Pathologist, in connection with the preparation of an Anti White Scour (Colon Bacillosis) and Anti-Kikuyu Fowl Disease serum.

These are being continued.

Technical Work. Experimental.

(1). *Outbreaks of Disease investigated and Field Investigations.*

(*a*) Visit to Gilgil area in connection with a mortality in cattle following Pleuro-pneumonia virus inoculations.

(*b*) Visit to Naivasha area in connection with a mortality in cattle, the cause of which was ultimately found to be due to Arsenical Poisoning.

(*c*) Visit to Naivasha in connection with a mortality in cattle and sheep, the cause of which was due to Heartwater.

(*d*) Visit to Nakuru (Molo Valley) in connection with Pleuro-pneumonia inoculations.

(*e*) Visit to Elmenteita in connection with an outbreak of Anaplasmosis.

(*f*) Visit to Limuru in connection with an outbreak and mortality in sheep and goats due to Strongylus contortus.

(*g*) Visit to Athi River in connection with a mortality in Equines.

(*h*) Visit to Nakuru (Molo Valley) in connection with Pleuro-pneumonia inoculations.

(*i*) Visit to Gilgil in connection with Pleuro-pneumonia inoculations.

Besides the above, visits were made by the Veterinary Pathologist to various localities in the Nairobi area in connection with Pleuro-pneumonia inoculations.

Outbreaks of Swine disease were also investigated "*in loco.*"

Laboratory and Field Experiments.

(2). *Rinderpest Immunisation.*

Experiments carried out during the previous year shewed that,

(*a*) The inoculation of Virulent Blood alone which had been stored at ordinary room temperature for 30 and 40 hours, respectively, after collection always produced a reaction to Rinderpest in non-immune cattle.

(*b*) The simultaneous inoculation of 30 and 40 hours old blood, respectively, and varying rates of Anti-Rinderpest serum, viz., 15 c.cs. and upwards, per 100 kilos body weight, did not always cause a reaction in susceptible cattle.

The non-reactors in a number of instances subsequently contracted Rinderpest by contact from the reacting animals with the result that a high percentage of mortality sometimes occurred amongst the former.

Experiments of the previous year also shewed that a larger dose of serum than that previously recommended resulted in a smaller percentage of mortality and it was accordingly recommended that the dose for cattle of *average* susceptibility should be increased from 15 c.cs to 20 c.cs per 100 kilos body weight, whilst for highly susceptible animals, the dose should be still further increased on the recommendation of the Veterinary Officer, previous experiments having shewn that the simultaneous inoculation of fresh virulent blood and Anti-Rinderpest serum up to, at least, 45 c.cs per 100 kilos produce a reaction in susceptible cattle followed by immunity.

During the year, further experiments were carried out to determine whether,

(1) The inoculation of Virulent Blood alone of less than 30—40 hours old resulted in a reaction to Rinderpest in non-immune cattle.

(2) The simultaneous inoculation of Virulent Blood of less than 30—40 hours old and varying rates of Anti-Rinderpest serum, 15 c.cs and upwards produced Rinderpest followed by immunity in susceptible cattle.

The results shewed that,

(1) The inoculation of 24 hours old blood alone gave a reaction and immunity.

(2) The simultaneous inoculation of 24 hours old blood and serum at the rate of 15, 20 and 30 c.cs. did not always produce a reaction in suspectible cattle.

The non-reactors acquired no immunity and contracted Rinderpest by contact from the reacting animals.

Recommendations based on the above-mentioned results were made that only fresh Virulent Blood and serum at the rates recommended be used for double inoculation purposes.

2. *The utilisation of Sheep for the supply of Virulent Rinderpest Blood at Centres distant from the Laboratory.*

Owing to the necessity of using fresh Virulent Rinderpest Blood for Rinderpest Immunisation purposes, it was decided to ascertain whether Sheep could be utilised to supply Virulent Blood at centres distant from the Laboratory.

In this connection the following experiments were carried out.

(*a*) To note whether sheep are susceptible to Rinderpest.

(*b*) Whether the blood of a reacting sheep produces Rinderpest in susceptible cattle.

(*c*) Whether cattle contract Rinderpest by contact from a reacting sheep.

The results shew that,

(*d*) Rinderpest is transmissible to susceptible sheep by,

(1) Inoculation of Virulent Blood of cattle.

(2) Dosing with Virulent Blood of cattle.

(3) The urine of a reacting sheep did not transmit Rinderpest to cattle.

(4) The in-contact experiments (reacting sheep in contact with susceptible cattle) were negative.

(5) That blood of a reacting sheep produces Rinderpest in susceptible cattle

The in-contact and transmission experiments with secretions of a reacting sheep (Urine, etc.,) are to be repeated.

Since the only indication of a reaction to Rinderpest in sheep is a temperature curve and, owing to the variations in temperature of normal sheep, particularly when moved or handled, it would be difficult, unless they were kept housed and disturbed as little possible for some days previous to, and after inoculation, to determine whether a reaction to Rinderpest was actually occurring.

This could be decided by inoculating a susceptible cattle. In the event of a reaction occurring, the blood of the latter could be utilised or, in the case of a dipped herd, a susceptible control be infected by contact with the reacting control.

3. *The preparation of Pleuro-pneumonia Vaccine in Bulk.*

Owing to the large increase in demands and the difficulty of obtaining filtering apparatus, it was necessary to introduce a method of preparing the vaccine in bulk.

Briefly, the difficulty to overcome was the obtaining of a clear culture medium by other means than sterilisation by filtration through a Filter Candle.

It was found possible to prepare this by sterilisation of the medium in the Autoclave at steam pressure and a temperature lower than that usually employed.

By this means, the technique of preparation has been simplified and large supplies of vaccine can be prepared, if necessary.

4. *Immunity conferred by inoculation of Pleuro-pneumonia Vaccine. (Exposure experiment).*

To test the immunity conferred by inoculation, 48 inoculated cattle and 18 controls (non-inoculated) were sent to the Masai Reserve during the latter end of March to be herded and bomaed with an infected mob for a period of 12 months or until conclusive results are obtained.

The experiment is now in progress.

5. *Serum Diagnosis of Pleuro-pneumonia.*

A Research Officer has been detailed to work out, if possible, a serum diagnosis based on the "Conglutination and Complement deviation" method.

If successful this should be of assistance in combatting Pleuro-pneumonia, and it will be possible to overcome the difficulties now experienced in detecting Pleuro-pneumonia in cattle which are otherwise apparently healthy and in good condition but which are a source of infection. (Old Lungers).

6. *Anaplasmosis (Gall Sickness) in Cattle.*

As the result of experiments carried out by Lignieres in the Argentine it has been recorded.

(1) That Anaplasma *argentinum* is transmissible to susceptible bovines by the blood of a sheep which had been inoculated with this infection.

(2) That bovines which had been thus inoculated acquired an immunity against Anaplasma *argentinum*.

(3) Further experiments are being carried out to determine whether the blood of a sheep which had been inoculated with Anaplasma *argentinum* could be employed for the immunisation of cattle against Anaplasma *argentinum*.

Experiments were carried out at Kabete to ascertain whether the blood of Sheep inoculated with Anaplasma marginale blood of a bovine could be utilised in the immunisation of cattle against Gallsickness.

These shewed that,

(1) Blood of Sheep which had been inoculated with Anaplasma marginale blood of a bovine did not produce Anaplasmosis in susceptible bovines.

(2) Blood of a bovine which had been thus inoculated did not acquire an immunity against Anaplasmosis.

The necessity of obtaining a vaccine for immunising cattle against Anaplasma marginale infection was realised and arrangements were made by the Hon. the Director of Agriculture of this Colony for the purchase, in Great Britain, of 4 cattle and the immunisation of these animals at the Onderstepoort Laboratory, Pretoria and their despatch to this Colony for use as vaccine producers.

7. *Swine Diseases Investigations.*

Investigations were commenced to determine the various diseases which occur in Swine in this Colony and preparations for the carrying out of a programme of work for the production of an Anti Swine Fever serum were made.

The utilising of Wart Hogs as Anti Swine Fever serum producers was investigated.

For this purpose a number of Wart Hogs were captured and railed to the Laboratory.

These were tested on their immunity to Rinderpest and found to be susceptible.

They were also found to be susceptible to Swine Fever.

The difficulty of controlling the spread of Rinderpest and Swine Fever in areas in which the Wart Hog exists will thus be realised.

The utilisation of Wart Hog as a serum producer is not hopeful.

The use of the domestic pig which has been found to be non-susceptible to Rinderpest would appear to be more hopeful.

8. *Dipping of Sheep and Goats.*

In view of the difficulty experienced in destroying the commoner carriers of Heartwater, viz, Amblyoma veriegatum and Amblyoma hebraeum in a 3 days strength Arsenite of soda dip, a number of Sheep, Merino, Persian and Crossbred Merino-Persian and a few Native Goats were dipped at intervals of 14 days in a 14 days Arsenite of soda dip.

Several dippings were carried out, with the exception of one sheep in which a dermatitis was produced, no ill-effects in the health of the Sheep were noted.

Experiments are to be continued.

It would seem that dipping at 14 days intervals in a 10 days strength Arsenite of Soda dip would be effective in destroying the "Bont" ticks and produce no ill-effects in the sheep.

9. *Ulcerative Lymphangitis—Curative Treatment.*

During the year, a number of Equines were sent to the Laboratory for treatment and an opportunity was afforded of noting the results of treatment which comprised the,

(1) Subcutaneous injection of a vaccine prepared from the pus of a lesion,

(2) or the intravenous injection of Iodine both treatments combined with cauterisation of affected parts with a pointed iron, followed by the application of a Biniodide of mercury blister.

Neither of these can be considered a specific.

In a number of cases recovery has followed and no recurrence has been reported. On the other hand, recurrences have occurred in seemingly recovered animals, or a fresh focus of infection has appeared, after a period of 12 months or more.

Healing of open lesions occurs soon after cauterisation and the application of the Biniodide of mercury and, in this way is beneficial in preventing spread of infection.

I have the honour to be,

Sir,

Your obedient Servant,

J. WALKER,

Veterinary Pathologist.

A NDIX D.

ANNUAL REPORT

OF THE

Division of Entomology,

Kabete,

FOR THE YEAR ENDING

31st March, 1921.

THE HON. THE DIRECTOR OF AGRICULTURE.

I have the honour to submit herewith a report on the work of the Division of Entomology for the year ending 31st March, 1921.

STAFF.

I was absent on leave for five months of the year returning to the Colony on the 19th September 1920.

During my absence, Mr. Dry acted as Chief of the Division. He left for home on the termination of his appointment, on the 12th February. I wish to put on record my deep indebtedness to Mr. Dry not only for his help in the work but also for his loyalty to the Division.

Mr. Wilkinson, Entomologist, arrived on the 23rd March 1920, on first appointment. He was in charge of the Mycological Laboratory during the absence of the Mycologist from April 28th till November 27th 1920.

Mr. T. X. da Cruz, Clerk to the Division, besides carrying on the clerical work, assisted Mr. Dry in various matters which really did not come within his province. He was for a time in charge of the breeding station on Mombasa Island and kept the notes for Mr. Dry.

Correspondence.

During the year 618 inward and 573 outward letters were dealt with. The subjects are summarised as follows:—

General	289
Flax	66
Coffee	59
Identification of specimens	46
Citrus	19
Stored products ...	18
Sericulture	17
Plant Imports ...	15
White Ants	13
Locusts	10
Coconuts	7
Cotton	6
Tsetse Flies... ...	6.
Bees	1
Sugar Cane ...	1
	573

Plant Import Inspection.

8352 consignments to the value of Rs. 431,810/13 were examined. Details are given in the Report of the Plant Import Inspector, a copy of which is attached.

Agricultural Show Nakuru.

The exhibit from the Division was comprised of twenty-five large cases containing most of the known injurious and beneficial insects of the Colony and Protectorate; fifty large cases showing the work of insects and damaged portions of trees, bushes and plants. A paper was also prepared on the "Insects affecting Stored Products." This was published in the *Farmers Journal* and copies, due to the courtesy of the Swift Press, were available for distribution on the Show Ground.

Imperial Entomological Conference.

During the first fortnight of June I represented Kenya as a delegate, at the above Conference. The report was presented to Parliament in July 1920.

Production of Raw Silk.

During the Imperial Conference, the Silk Committee of the Imperial Institute discussed, with the Entomologists concerned, the importance of encouraging the production of raw silk within the Empire. The information required is:—

(*a*) The amount of leaf which one acre of mulberry will produce in a year.

(*b*) The number of worms it is possible to bring to maturity on this leaf.

(*c*) The weight of raw cocoons obtained.

(*d*) The weight of dry cocoons obtained.

(*e*) The amount of raw silk obtained.

(*f*) The market value of this silk.

(*g*) Cost of production.

When the experiments, going on now, are completed, results can be expected for (*c*), (*d*), (*e*), (*f*), (*g*) but definite figures for (*a*) and (*b*) will take longer to obtain as the acre of mulberry which was planted in November will not come into full bearing for some time.

A consignment of silkworm eggs has been obtained and the cocoons raised will be sent home for valuation and report.

Wax Production.

In conjuction with Mr. H. H. King, Entomologist, Sudan, a new type of Beehive called the "Khartoum Hive" has been introduced and the natives have been encouraged to make and use this type in preference to their own log hive. There is a possibility of further developing an export trade in this valuable commodity, which is purely a native production.

South African Locust Bureau.

Reports from this Bureau are issued from time to time for the information of countries surrounding the Union. The several Governments, in return, keep the Bureau acquainted with the state of affairs in respect to Locusts in their territories.

Research Work.

During the year special attention was paid to, 1. *Insects and Stored Products*: It is very difficult to estimate the losses caused by the depredation of insect pests in stored products of all kinds, but this loss must be very considerable.

A whole series of investigations is in progress to determine (*a*). the actual species responsible for the damage (*b*) the life cycle of each of these and its relation to its environment (*c*) control measures.

As an export trade in cereals and pulse increases, greater care will have to be taken in storage and handling, and the best methods of storage are being investigated. These experiments have been going on for only a short time and no definite figures are as yet available.

2. *Sericulture*. The results obtained, to date, have been encouraging. The experiments have been conducted in the Insectary which, during the time, has not been available for any other line of work.

3. *Flax Caterpillar.* (Phytometra orichalcea), F.

Many dusts of different compositions were used on the experimental plots infested with this caterpillar. The best results were obtained with a mixture of one part Paris Green to three parts extremely finely powdered lime.

The dusting was done with a small hand duster kindly loaned by Messrs. Simpson and Whitelaw.

The arrival of a power duster will enable field trials, on an extensive scale to be undertaken, when the exact amount of dust per acre and costs will be determined.

It will probably be found that about 25 lbs. of the mixture will be sufficient per acre. On a small scale this gave a 95% mortality.

Other mixtures will be tried and it is possible that something cheaper will be evolved which can be made locally.

4. *Coconut Beetle.* The series of traps on the Coast are to be discontinued as it is considered that they have served their purpose. As far as was possible in the time at his command, Mr. Dry worked out the life-cycle of the Beetle. He found that the times were:—

Egg, 15 days.

Grub, 80 days or more.

Pupa, 21 days.

Adult life often more than 2 months.

The traps, properly made and properly supervised, were successful in providing breeding places for thousands of beetles which would otherwise have caused increased damage to the palms.

5. *Insects affecting Coffee.* Most of the work in this connection was advisory in conjunction with visits to and inspection of plantations.

Work on Thrips has advanced but it has not yet been possible to rear the insects from egg to adult.

Dusting has been tried for Antestia but with little success. A further series of experiments will be conducted.

Borers have been prevalent but fairly easily controlled by pruning and the injection of carbon bisulphide.

6. *Garden Crops.* The life histories of the following have been worked out in detail and will be published:—

The Diamond back moth (*Plutella Muculipennis*).

The Bagrada Bug (*Bagrada picta*).

The Turnip Saw-fly (*Athalia sjostedti*).

The Cutworms (*Euxoa species*).

The Laboratory.

The two rooms have been repainted; guttering has been put up round the Laboratory and the Insectary; additional cabinets for the collections have been added; additional bench accommodation and shelves have been erected in all the rooms and in the Office. A plan has been made of the grounds but little has been done in the way of laying out and road making owing to the shortage of money for labour.

The Library.

Additional shelves have been added; many volumes of Bulletins and Pamphlets have been bound, exchanges have been arranged with other countries; a complete index is in course of preparation but this will taken some time to complete.

Publications.

Mr. Dry has published the following papers in the Bulletin of Entomological Research:—

"Flax Caterpillars in Kenya Colony, with special reference to the limitations of the roping method of combating them."

"The Red scale *Chrysomphalus aurantii, Mask* in Kenya."

"The Egg Parasites of the Coffee Bug *Antestia lineaticollis Stal* in Kenya Colony."

A paper entitled "Insects and Stored Products" was prepared for the Nakuru Agricultural Show and was published in the *Farmers Journal* of 9th December, 1920.

Additions to the Collection.

The Entomological Record for the year shows the following which have been added during the year. We are indebted to the Director, Imperial Bureau of Entomology for determining the many specimens sent for identification.

Orthoptera	...	17 species
Odonata	...	14 ,,
Hymenoptera	...	19 ,,
Coleoptera	...	143 ,,
Lepidoptera	...	3 ,,
Diptera	...	4 ,,
Rhynchota	...	62 ,,
		262 species

I have the honour to be,

Sir,

Your obedient Servant,

THOS. J. ANDERSON,

Chief of Division.

Appendix **E.**

ANNUAL REPORT

OF THE

Mycological Division,

FOR THE YEAR ENDING

31st March, 1921.

The Hon. The Director of Agriculture.

I have the honour herewith to submit the report of the Mycological Division for the year ending March 31st 1921.

Staff Changes.

In April 1920 Mr. Dowson proceeded to England on leave and the work was carried on by Mr. Wilkinson of the Entomological Division. While still in England Mr. Dowson resigned, and I arrived in Nairobi on November 7th, 1920, and took over the Mycological duties from Mr. Wilkinson.

Travelling.

During the year some 3,000 miles of travelling was done in visiting settlers' farms and in making field investigations of special diseases. Visits were paid to Nakuru, Njoro and the Solai Valley, Kisumu and Kibos and Nyeri as well as Limuru, Ruiru, Thika Ngong and other places in the neighbourhood of Nairobi. In all about 45 farms were visited.

Laboratory Work.

At the Laboratory approximately 100 enquiries were received and examinations were made and replies sent re 80 specimens of diseased plants submited for investigation.

No new disease of any considerable importance was reported during the year although isolated cases of one or two lesser diseases were observed for the first time in this country.

One of these "Red Mould" of wheat was reported from Kericho district where a few scattered ears were found shewing the reddish pink mouldy condition due to the fungus *Fusarium culmorum*. In the case in question its occurrence was associated with excessively moist conditions.

The fungus *Ustulina zonata*, which is a common cause of root disease of such crops as tea, coffee and rubber when planted on old forest land, was found to be the cause of numerous deaths of pear and peach trees in an orchard planted under similar conditions.

As in previous years the chief diseases occurring in coffee were the Leaf Disease and Dieback, the former being noticeably more prevalent in June and July, following on the long rains.

In February spraying trials were begun to test the efficiency of a proprietary spray against the Leaf Disease of Coffee. Results of these trials will not of cours ebe known for some time.

Cases of Wilt of flax due to the fungus *Fusarium lini* were reported from Sotik, Kericho, Lumbwa, Eldoret and Njoro, so that none of the chief flax centres is immune.

Some further work was carried out on the treatment of flax seed with formaldehyde vapour to kill adhering spores of the Wilt fungus, and a report on the results was communicated to the local press at the time.

Seed Testing.

The work of seed testing was carried out at the Laboratory, reports on the germination and purity of 30 samples mostly flax being made.

Other Work.

In June a course of 8 lectures to Soldier Settlers was given at Kabete and in December a Mycological stall was arranged at the Nakuru Agricultural Show illustrating the principal diseases met with in the Colony.

Inspections of imported plants and seeds were carried out at the General Post Office, Nairobi, and elsewhere as they arrived in the country.

J. McDONALD,
Mycologist.

APPENDIX F.

ANNUAL REPORT

OF THE

Plant Import Inspector,

FOR THE YEAR ENDING

31st March, 1921.

THE HON. DIRECTOR OF AGRICULTURE,
NAIROBI.

I have the honour to submit my report for the year ending 31st March, 1921.

For well known reasons the exports have fallen off greatly since the middle of last year, but an increase may still be recorded. The imports show a handsome increase.

As against 618 consignments imported last year we have 8,352 this year and against 30,529 bags of grain, etc., exported last year we have 37,015 this year.

The imports with their corresponding values are:—

	No. of Packages, etc.	*Value.*
	No.	Fls.
Flower seeds	247	4,180
Vegetable seeds	293	6,376
Farm seeds	176	30,902
Agricultural seeds	7,120	374,656
Fruit seeds	44	359
Forest tree seed	26	338
Roots and bulbs	51	665
Fruit trees	202	9,014
Flower plants	173	4,626
Tea seed	16	655
Cinchona	4	34
	8,352	431,810

The exports examined by me consisted of the following produce but the figures do not represent the actual bulk of these goods despatched overseas

	No. of Bags.	*Value.*
		Fis.
Potatoes ...	... 687	... 4,250
Coffee ...	... 363	... 22,400
Beans ...	... 9,020	... 141,896
Maize ...	... 26,780	... 307,934
Peas ...	... 13	... 520
Ground nuts	... 1	... 25
Cotton seed	... 151	... 1,006
	37,015	478,131

The fumigating chambers were repaired but their condition remains, from the nature of their construction, in an unsatisfactory state.

A. H. WILSON,
Plant Import Inspector.

APPENDIX G.

ANNUAL REPORT

ON THE

Government Stock Farm, Naivasha,

FOR THE YEAR ENDING

31st March, 1921.

THE HON. THE DIRECTOR OF AGRICULTURE,
NAIROBI.

Sir,

I have the honour to submit herewith my first Annual Report for the year ending the 31st March, 1921.

The gazetted date of my appointment as General Manager of the Naivasha Stock Farm was the 25th December, 1919, but it was not until the 1st March, 1920, that I took over the control of the farm.

The intervening period was occupied almost entirely in the endeavour to trace pedigree records of the cattle form diaries and other available sources, a task rendered exceedingly difficult owing to the paucity of proper records of breeding. That some such records must have been kept in the past would appear to be certain from the annual reports published by the late Manager, but no trace of these could be found subsequent to his death in 1918. Systematic search through diaries dating back to 1905 enabled me to trace a number of cattle to early importations, but many links in the chain are missing owing to the loss of ear tags and other means of identification.

Upon assuming the management of the farm, I found an almost entire absence of all the essentials for its successful conduct. Not only were the implements entirely useless or nearly worn out, but there existed no instruments or appliances for dealing with accidents, few drugs or dressings and no stores of

any description. To add to the difficulties, practically every fence on the farm was broken down, not a gate was intact and the farm buildings were all in a deplorable condition.

The farm was exceedingly heavily stocked, the count on March 1st showing 455 head of cattle, 3,448 sheep, 409 goats, 97 donkeys and 13 horses and mules, although a sale had taken place during the month previous at which 173 head of stock had been dispersed. Nominally the breeds of cattle represented consisted of Shorthorns, Herefords, Frieslands, and Ayrshires and the sheep of Merinos, Suffolks, Lincolns, Shropshires and Karakuls, but in reality grades and crosses of all these different breeds and of several others formed a very considerable proportion of the stock. By the disposal during the year 232 head of cattle, exclusive of 42 imported bulls, 1,764 sheep, 236 goats and 38 donkeys, overstocking has been somewhat reduced and a number of the undesirable grades and crosses eliminated. By a continuance of this process of elimination and by replacement with pure bred stock, it is hoped that in course of time the farm will take its place as the source from which pedigree sires may be obtained for the improvement of the flocks and herds of the Colony.

During the year some progress has been made in replacing broken down boundary fences, whilst the portion of the farm adjoining the lake has been divided into four by the erection of new fences. Three of these divisions now form paddocks for stock which thrive amazingly on the magnificant pasture, whilst the fourth, an area of some 50 acres is reserved for cultivation. About 30 acres of this are now under the plough and this acreage will be increased by degrees. Previously to the erection of these fences, the crops were entirely consumed by hippopotami, but since then, extremely heavy yields of maize grown for ensilage and several cuts of lucerne have been saved. It is intended to gradually increase the area under lucerne which grows most luxuriantly and yields a crop practically every month during the year, and also to continue experiments, already in progress, in the cultivation of Sudan grass, cow peas and other forage crops and thus render the farm self-supporting. Although the long rains were insufficient to cause a heavy growth, enough meadow hay was saved to fill the two Dutch barns. Three pits of ensilage have been filled. Natural grazing has been sufficient for requirements although watering difficulties have prevented the due use of the Naivasha (Kerati) portion of the farm. It is hoped that the erection of a windmill and drinking troughs in the near future may enable the maintenance of a larger head of stock on this portion of the farm. A new well has been sunk near the farm buildings and the forthcoming erection of a windmill here will greatly facilitate the watering of stock as well as the maintenance of the cattle and sheep dips which at present have to be filled by hand. Minor structural alterations have been made at the farm buildings and the construction of efficient drafting and dosing pens have greatly facilitated the handling of sheep.

Cattle.

The elimination of a number of cattle of unknown parentage and undesirable type, together with the importation of well bred cows and heifers has done much towards rendering the four herds more uniform in appearance. Some of the cows discarded, or slaughtered, were animals that had been imported as long ago as 1908, a proof of the healthiness of the farm. Every barren cow was ruthlessly culled and sent to the butcher with the result that the birth rate of just over 70 per cent. compares favourably with that of previous years. It is anticipated that this percentage will be further increased by the practise, now followed, of allowing the bulls to run with their cows every night. The rather complicated system of horn branding formerly in vogue has been abandoned in favour of ear marking which possesses the advantage of simplicity and permanency. Herd registers have been opened for each breed and all that are eligible have further been entered in the first volume of the East African Stud Book. Weekly dipping has been practised throughout the year. The health of the cattle has, on the whole, been good and although the deaths during the twelve months totalled 44, no less than 21 of these were attributable to accident or to intentional slaughter, so that 5 per cent. would approximately represent the death rate and this includes several very aged cows and weakly calves. Two deaths were caused by lion and four by falls from the river bank.

The Shorthorn Herd consists of 83 head of pure, grade and cross bred cattle, headed by the bulls, Springvale Chieftain, 1431 S.A.S.B., and Tamlaght Crest, Vol. 65 C.H.B., both imported from South Africa last December together with ten pure bred cows. Although some of these ten are aged and scarcely of the type desired, it is upon them that the herd must rely in the future, the majority of the original importations having been so crossed with a Lincolnshire Red and sundry unregistered bulls, that scarcely any of their produce are now eligible for registration although many are handsome animals calculated to breed well to the two bulls now in use. The grade cows and their progeny compare well with any in the Colony, both in size, quality and type, and go far to counteract the widely held belief that high grades are lacking in size, stamina and constitution. In former reports from this farm, the Shorthorns have been described as shy breeders. This has not been found to be the case during the past year, practically all the cows having either bred a calf or being now in calf in spite of the fact that for four months the herd was without a bull. Some of them are also good milkers, and seldom has a cow failed to do justice to its calf. Amongst the young stock are some promising animals by Rietvallei Idaho 965 and Imokilly Orphan Duke 884, both South African importations, whilst the calves of the recently imported cows are exceptionally good.

The Hereford Herd, although small, consisting of only 41 head, is in many respects the most interesting collection of cattle on the farm, as showing the remarkable success which can be achieved by grading up from native stock. Only four out of the 21 cows which now compose the herd are the progeny of pure bred stock, yet a more symmetrical collection of large-framed heavily fleshed and characteristic grade cattle could scarcely be found anywhere. The Hereford breed has quite undeservedly gained the reputation in Kenya of being slow breeders and bad mothers. The experience of the past year has not borne out this reputation; for although the birth rate only amounted to 65 per cent. by far the greater number of calves were born as the result of running the bull regularly with the herd instead of driving the cows long distances to the bull. Nor is the second complaint justified. In no single instance has a cow failed to do its calf well. Further, the contention that the breed is delicate would not appear to be well founded. Of the five deaths recorded—all calves—only one died a natural death; of the remainder one was killed by a lion, one from swallowing a nail, one by arsenical poison and one deformed calf was destroyed.

The Friesland Herd numbered 117 on March 31st and consisted almost entirely of pure bred cattle, recently augmented by the importation of 19 cows and heifers from South Africa. Three bulls are at present in service—General Britz 2010, a son of Kalma XI who for some time held the South African milk record, Sheltered Vale Sir Korndyke 1809, a very handsome bull bred by Mr. E. E. Downing, Natal, and Melrose Niklass, a young bull imported recently and possessing a double cross of the famous Paul 1465. The Friesland herd has always been fortunate in having had the advantage of good imported bulls at the head, and many of the cows are heavy milkers. In some instances good milking cows have been spoiled by the practise of allowing the calves to run with their dams, but the young stock are promising and should give good results later. Hitherto, it has been impossible to make a commencement with regular milk recording owing to all available accommodation being utilised by bulls imported for purposes of sale, but as soon as the new calf pens now under construction are completed, the yield of each cow will be weighed daily. So many Frieslands have left the farm during the year that an accurate estimate of the birth rate is impossible, but 43 calves have actually been earmarked and most of the remaining cows were in calf at the time of sale, so that it is safe to assume that the percentage of births was not far short of eighty. Apart from those sold, a selection of ten cows and a bull was sent to found a herd at Kabete Experimental Farm.

The Ayrshire Herd now consists of 45 head. Practically all the cows are descendants of pure bred Ayrshires imported from Scotland in the early days of the farm's history. A handsome young bull, Finlayston White Raider 18764, now stands at the head. He, together with a heifer bred from a famous milking strain, was imported from Scotland last year. The breed has

adapted itself well to the conditions of the farm and although it tends to put on more flesh than might be thought desirable under home conditions, the cattle are true to type, robust in constitution and are regular breeders. In comparing the herd with other breeds on the farm, it has been frequently remarked that they excel all in type, character and quality, but it should be remembered that, from the establishment of the herd, good imported bulls have always been in service. Essentially a dairy breed, it is imperative that milk records should be systematically kept, but as in the case of Frieslands, many of the cows have suffered from the long continued practise of allowing the calves all the milk produced by their dams. Owing to the number of cows which have been sold or sent to Kabete during the year, it is difficult to give the percentage of births, but 17 calves have been earmarked from little more than a score of cows.

Sheep.

Naivasha has always possessed the reputation of being a sheep country and Morendat was regarded by the Masai as the best portion of it. This fact was early recognised in the history of the farm and sheep have for many years occupied quite as much attention from those in charge as have the cattle. From time to time rams of various breeds have been imported from Great Britain, whilst several of the most famous flocks of Australia and South Africa have contributed sires, as well as some ewes to maintain the Merino flock. Good work was done in educating the early settlers to make use of the breeds most suitable for grading up the native sheep of the country and many of the flocks in Kenya owe their origin to the sheep bred on the farm. The difficulty of importing stock during the five years of war together with the death of the late Manager, an enthusiastic sheep breeder, had their effect upon the Government Farm sheep.

On March 1st 1920 there were no less than 3,448 sheep. These, as already indicated, included examples of the Merino, Suffolk, Lincoln, Shropshire and Karakul breeds together with a variety of grades and crosses with traces of the Welsh and Kerry Hill breeds which had existed on the farm in former years. The majority of these sheep were undoubtedly quite a useful asset from the point of view of wool production, and the revenue derived from this source probably justified their retention, but they could not for a moment be regarded as suitable dams for stud rams. It was therefore decided that every sheep which showed traces of cross breeding or which did not attain the desired standard either in conformation or type, should be gradually eliminated. In furtherance of this policy, no less than 1,764 sheep were dispersed, the majority being sold by auction at one or other of the three sales held during the year. Amongst these were all the Lincoln and Shropshire grades as well as a variety of crossbreds, with the result that the flocks now remaining consist of creditable specimens of the Merino, Suffolk and Karakul breeds. At the beginning of the period under review

there were a number of recently weaned lambs born during the months of November and December. These lambs were suffering badly from the effects of dry weather shortly after birth and consequent scarcity of milk and the death rate amongst them during the following months was exceedingly heavy. Practically every sheep on the farm was heavily infested with wire worm which the customary monthly administration of Cooper's Dip and salt appeared powerless to check. Indeed, with the exception of the lambs referred to above and about 50 deaths from Bluetongue, practically the whole of the heavy death roll which averaged over 30 per mensem, may be attributed directly or indirectly, to this scourge. In support of this statement, which may be considered too sweeping, it may be mentioned that since the Wire Worm sepcific issued by the Division of Veterinary Research, Pretoria, has been used, the death rate from natural causes has been reduced to a minimum. The natural increase during the year by lambing amount to 703, but owing to the number of deaths and sales, there remained on the farm 1,909 sheep of all ages on March 31st, 1921.

Lambing took place in June and July, and no second crop of lambs was taken as in previous years. The lambs fell strong and healthy but a considerable number were lost at about a fortnight old from a form of Enteritis. Owing to the number of ewes sold at the May sale, an exact estimate of the percentage of lambs to ewes was not recorded, but few of the younger ewes missed, examination of the barren Merinos showing that in almost every instance they were very aged.

Shearing was commenced on September 9th and finished on September 17th, a period of eight working days during which twelve natives sheared 1,845 sheep. I much regret that particulars respecting the clip of wool from individual sheep and the comparison of weights at various ages are not available, the records kept by the Stockman in charge at the time having been mislaid. In all 25 bales of wool and one of mohair weighing 16,793 lbs. were sent to London for sale. Shearing was carried out fully two months earlier than usual so that no sheep bore more than ten months growth of wool.

Special attention should be drawn to the beneficial results which have followed the regular monthly use of the Wireworm Remedy, prepared at the Veterinary Laboratory, Pretoria. Not only have the debilitating effects of wireworm been practically eradicated, but although an average of 2,000 sheep monthly have undergone treatment, not a single death can be directly traced to its use.

Some of the sheep have recently been immunised to the effect of Bluetongue by the administration of a locally manufactured vaccine. It is intended to inoculate the remainder as soon as the lambs have been weaned.

The experiment of crossing the pure bred Karakul rams, received from South Africa with native East African ewes has met with considerable success, the increased size and weight of the half bred progeny being most marked. The half bred rams met with a ready demand when offered for sale and others have been sent to the Masai Reserve where they should do much good to native flocks. A small but symmetrical flock of half bred ewes is being retained for further experiment with another cross of pure blood.

During the year four pure bred Suffolk Rams were imported from England, together with two Karakul and seven Merino rams from South Africa.

Goats. The flock of grade Angora goats is remarkably hardy; deaths, except amongst new born kids, being of rare occurrence. At the sales during the year, when 236 head were dispersed, competition was keen. A heavy clip of mohair was taken in September, the fleeces being of good quality, length and lustre. A total of 212 of all ages remained on the farm at the end of March.

Horses. The Hunter-bred stallion, Royal Fox, now in his nineteenth year, still continues to be well patronised and a number of promising foals have been born. In addition to the stallion, there are now five brood mares, two three-year olds and five yearlings and foals on the farm, and two of the mares are nearly due to foal again.

Donkeys. In spite of the sale of 38 donkeys during the twelve months previously there were still 64 grade mares and young stock as well as two pure bred Catalonian Jackasses on the farm on March 31st, twenty-three mares having foaled in the twelve months.

Sales. Three sales were held during the year; those of May 4th, 1920 and January 4th, 1921, comprising surplus farm bred stock, and that on March 22nd, 1921, bulls imported from South Africa together with some farm bred cattle and sheep.

Exhibition. A collection of 23 head of cattle and 19 sheep and goats was taken to Nakuru for exhibition at the show held by the Agricultural and Horticultural Society in December.

Visitors. The farm continues to be of considerable interest to visitors. Amongst these have been many of the recently arrived soldier settlers as well as tourists in East Africa. The neighbouring territories of Uganda and Tanganyika have been represented as well as India, Australia, New Zealand, South Africa, Belgium, Denmark and the Channel Islands.

Staff. Until the close of 1920, assistance was only available from men temporarily engaged. Then two new appointments of Stockmen were made: Mr. J. Forsyth, who is skilled particularly in cattle management and Mr. A. E. Dircks who has had a special training in sheep and wool at the Grootfontein Agricultural School in South Africa. Their duties have been efficiently performed and my thanks are due to them for the assistance which they have rendered in the task of improving this farm and its stock.

I have the honour to be,

sir,

Your obedient servant,

J. H. D. BEALES,
Manager.

Appendix II.

ANNUAL REPORT

OF THE

Experiment Farm, Kabete,

FOR THE YEAR ENDED

31st March, 1921.

The Hon. The Director of Agriculture,

Nairobi.

I have the honour to submit herewith the thirteenth Annual Report for this farm for the year ending 31st March, 1921.

Staff Changes.

The undersigned was gazetted as Manager from the 19th November, 1920.

Mr. Burton, Plant Breeder, arrived on the 31st March, 1921.

Mr. Butler, Agricultural Instructor ,left this farm on the 12th July, 1920, to take up duty as Acting Manager at Mazeras Farm.

Miss Kemp took over the duties of Housekeeper at the Students' Hotel on the 1st March, 1921. Mrs. Wilson acted as Honorary Housekeeper from the 1st May, 1920, to the 28th February, 1921.

Work with Students. During the period under review, an average number of thirteen Students have been in residence and training on the farm.

When numbers have warranted it, we held a lecture course for the duration of one month, on the same lines as adopted on arrival of the numerous Settlers from the S.S. "Garth Castle" at Christmas, 1919.

The course commenced on the 7th June and terminated on the 7th July, 1920.

All the officers on the farm gave lectures and demonstrations on crops and stock; in addition, lectures were given by various officers from other Divisions and Departments.

During the year, all officers have assisted the various Students by discussion and demonstration on different Agricultural matters.

Students have been required to take an interest in, and assist with, the actual work of the farm.

The majority of our Students were ex-Soldier Settlers who came here to take up their farms, under the ex-Soldiers' Land Settlement Scheme. Others came out to take up land by local purchase. A few have been engaged in Agricultural persuits previously. Comparatively few of the Students, under the ex-Soldiers' Settlement Scheme, have had previous training in farming; yet the majority have been able, after a month or two's instruction here, to proceed to and develop their properties.

In many cases, after a Student has left and been in residence on his own farm, we have been asked to advise when a difficulty has arisen while, in other instances, Students have returned here for further instruction pertaining to particular subjects.

The monthly numbers of Students in residence, throughout the year, was as follows:—

April	...	5
May	...	6
June	...	22
July	...	23
August	...	10
September	...	14
October	...	15
November	...	13
December	...	9
January 1921	...	10
February 1921	...	13
March 1921	...	11
Total	...	136

TRAVELLING.

(1) *Show.* All the Staff were on duty at the Agricultural Show, held at Nakuru in December 1920, where the various products of the farm were on exhibition.

The undersigned acted as Joint Judge in Cotton, Sugarcane and District Exhibits.

Mr. Hamilton judged flax and Mr. Sparrow acted as Steward.

(2) *External Lecturing.* A lecture on cotton growing was delivered in May before the members of the Rongai and Lower Molo Farmers Association.

The undersigned in the absence of the Coffee Officer on leave acted as Coffee Inspector. Visits were made to several districts, viz., Kyambu, Ruiru, Limoru, Thika, Nakuru, Solai and Kericho.

This work gave an opportunity of securing an insight into Agricultural conditions prevailing in the Colony and led to the realisation of the great variation in local conditions.

The work done by the various officers concerned is embodied in their own reports.

A large number of Settlers and others have visited the farm, either with the object of seeing what work was being done or to get information on some particular subject.

Experimental work. The experimental work conducted on the farm has been in continuation of previous years, both in the Nursery Plot and Field Plot Experiments, with the addition that all the varieties of wheat were grown in two groups, viz.,—after Fallow and after a Leguminous crop.

There were twenty-six plots of one-ninetieth of an acre each; thirteen plots in each group. We further attempted to estimate the rust-resistence of the various varieties.

The average yield, per acre, after Fallow was:—843 lbs. against 713 lbs. after Leguminous crops.

Undernoted are Tables giving records of the Nursery plots:—

Nursery Plot Experiment, 1920-1921.—(WHEAT).

Variety.	Date of Planting.	Previous Crop.	Seed per acre.	Duration.	Date of Harvesting.	Rainfall before Planting.	Rainfall during Growth.	Percentage Rust-resistance at cutting.	Yield per acre.
Union, "52" ...	7th May, 1920	Beans	90 lbs.	141 days	24th Sep. 1920	14·84"	6·72"	97%	980 lbs.
Warren ...	do	do	do	141 do	do	14·84"	6·72"	97%	990 ,,
Neapolitan ...	do	do	do	141 do	do	14·84"	6·72"	40%	1,080 ,,
Fourie ...	do	Peas	do	154 do	7th Oct. 1920	14·84"	7·22"	20%	315 ,,
Gluyas Early ...	do	Beans	do	144 do	27th Sep. 1920	14·84"	6·72"	30%	1,080 ,,
Australian White ...	do	do	do	144 do	do	14·84"	6·72"	40%	630 ,,
do. Brown ...	do	do	do	144 do	do	14·84"	6·72"	70%	630 ,,
Firbank ...	do	do	do	145 do	28th Sep. 1920	14·84"	6·72"	50%	360 ,,
Heatley's White Nandi ...	do	do	do	145 do	do	14·84"	6·72"	20%	540 ,,
Union "31" ...	do	do	do	141 do	24th Sep. 1920	14·84"	6·72"	40%	810 ,,
Lang Korren ...	do	do	do	154 do	7th Oct. 1920	14·84"	7·22"	Nil	Failure
Cross, 12/1 ...	do	do	do	141 do	24th Sep. 1920	14·84"	6·72"	70%	630 lbs.
Cross, 15/1 ...	do	do	do	145 do	28th Sep. 1920	14·84"	6·72"	80%	1,232 ,,
Union, "52" ...	8th May, 1920	Fallow	do	144 do	do	14·84"	6·72"	80%	1,000 ,,
Warren ...	do	do	do	144 do	do	14·84"	6·72"	30%	1,000 ,,
Cross, 12/1 ...	do	do	do	140 do	24th Sep. 1920	14·84"	6·72"	40%	630 ,,
Cross, 15/1 ...	do	do	do	143 do	27th Sep. 1920	14·84"	6·72"	70%	1,000 ,,
Lang Korren ...	do	do	do	153 do	7th Oct. 1920	14·84"	7·22"	Nil	540 ,,
Union, "31" ...	do	do	do	140 do	24th Sep. 1920	14·84"	6·72"	40%	810 ,,
Heatley's White Nandi ...	do	do	do	144 do	28th do	14·84"	6·72"	10%	810 ,,
Australian Brown ...	do	do	do	142 do	26th do	14·84"	6·72"	60%	1,260 ,,
Firbank ...	do	do	do	144 do	28th do	14·84"	6·72"	80%	1,170 ,,
Gluyas Early ...	do	do	do	140 do	24th do	14·84"	6·72"	70%	1,000 ,,
Australian White ...	do	do	do	144 do	28th do	14·84"	6·72"	30%	900 ,,
Neapolitan ...	do	do	do	144 do	28th do	14·84"	6·72"	40%	296 ,,
Fourie ...	do	do	do	153 do	7th Oct. 1920	14·84"	7·22"	50%	540 ,,

With the object of selecting seed which would be of use for Plant Breeder on his arrival, we planted a few rows of our proved rust-resisting varieties and some others.

In the field Plots, the various wheats of proved rust-resistance were grown and, in addition, fourteen varieties of wheat imported from South Africa.

Our own established varieties were "rogued" as far as possible with the aim of getting seed true to name. This has not been a great success as there are so many varieties of similar appearance which have, somehow or another crept in at an earlier period and it is not work which can be satisfactorily carried out in field Plot experiments.

I regret that the new varieties, obtained from South Africa, were a complete failure on account of rust, although the weather conditions, during second season, were quite favourable.

Barley. During both seasons, barley was grown on the farm. The second season's crop gave much better results. The barley grown on Plot 15, which has been run on the five season rotation experimental scheme, has given decidedly the best results. In the first season the barley in Plot 15 suffered very considerably from birds to which ,I attribute the low yield although it is exactly the same yield, per acre, as that grown on Plot 4.

Below is the table of records:—

Field Plot Experiments, 1920-1921. Barley: (1st SEASON 3½ ACRES.)

Variety.	Area.	Plot No.	Date of Planting.	Previous crop.	Seed per acre.	Duration.	Date of harvesting.	Rainfall before planting	Rainfall during growth	Yield per acre
Wisconsin, No.6	2½ acres	4	29th May, 1920	Rape	75 lbs.	119 days	Sep 24,1920	17·80″	3·76″	324 lbs.
do.	1 „	15	24th Mar. 1920	Potatoes	do.	171 do.	Sep 10,1920	7·49″	24·83″	324 „
				2nd SEASON 4 ACRES.						
do.	3 „	7	11th Nov. 1920	Flax	do.	113 do	Mar. 2,1921	3·36″	16·73″	500 lbs.
do.	1 „	15	3rd Nov. 1920	Grass	do.	123 do.	Mar. 5,1921	3·06″	16·84″	1,057 „

Teff Grass. Different rates of seeding per acre were tried in order to ascertain which would give the best results.

From the table underneath it will be noted that 18 lbs. of seed to the acre has given the best return. This is a very much higher seeding than that adopted in other Countries where 5 to 7 lbs. of seed per acre is usually sown. The fact of more seed being required here is probably due to heavy rains which wash these small seeds too deeply into the ground. In all cases the ground was rolled before sowing and the seed lightly brushed over.

Experiments in Nursery Plots: (TEFF GRASS).

Date of Planting.	Previous crop.	Seed per acre.	Duration.	Date of harvesting.	Rainfall before planting.	Rainfall during growth.	Yield per acre Hay.				Seed.
							Tons.	Cwt.	Qrs.	lbs.	
18th May, 1920	Wheat	18 lbs.	137 days.	1st Oct. 1920	15·44″	6·12″	2	8	0	0	630 lbs.
do	do	16 do	137 do	do	15·44″	6·12″	2	4	1	18	585 do
do	do	14 do	137 do	do	15·44″	6·12″	2	4	1	2	540 do
do	do	12 do	137 do	do	15·44″	6·12″	2	2	1	22	485 do
17th May, 1920	do	20 do	130 do	do	15·08″	6·48″	2	7	1	18	585 do
do	do	15 do	130 do	do	15·08″	6·48″	2	4	0	12	450 do
do	do	10 do	130 do	do	15·08″	6·48″	1	17	0	0	360 do
do	do	9 do	130 do	do	15·08″	6·48″	1	8	0	4	260 do
do	do	8 do	130 do	do	15·08″	6·48″	1	6	2	2	270 do
do	do	7 do	130 do	do	15·08″	6·48″	1	6	0	13	180 do
do	do	5½ do	130 do	do	15·08″	6·48″	1	4	0	12	135 do

One acre of Teff grass, in continuation of the five season rotation course, was grown in the field. Results of this will be found in the Rotation Table.

Potatoes. Five varieties of potatoes, which have been grown here for some time, were planted in the Nursery; all varieties being planted at the same distances. The intention not so much being to ascertain results as to retain the varieties.

[7]

They were all grown on fallow, without manure. Table of results below:—

Experiments in Nursery Plots.—(POTATOES).

Variety.	Date of Planting.	Previous crop.	Duration.	Date of harvesting.	Rainfall before planting.	Rainfall during growth.	Yield per acre.			
							Tons.	Cwts.	Qrs.	lbs.
White City ...	22nd May, 1920	Fallow	113 days	11th Sept, 1920	15·88″	5·61″	2	12	0	26
do ...	do	do	113 do	do	15·88″	5·61″	3	17	0	16
Early White ...	do	do	113 do	do	15·88″	5·61″	4	6	3	4
do ...	24th May, 1920	do	111 do	do	17·01″	4·48″	4	14	3	8
do ...	do	do	111 do	do	17·01″	4·48″	3	16	1	10
do ...	do	do	111 do	do	17·01″	4·48″	3	5	3	16
Carter's Mainstay ...	do	do	111 do	do	17·01″	4·48″	3	13	0	14
do ...	do	do	111 do	do	17·01″	4·48″	3	17	3	22
do ...	do	do	111 do	do	17·01″	4·48″	3	8	1	6
Factor ...	do	do	111 do	do	17·01″	4·48″	2	9	0	2
do ...	do	do	111 do	do	17·01″	4·48″	3	5	3	16
King of Early ...	25th May, 1920	do	110 do	do	17·71″	3·78″	4	2	0	0

Beans. Fifteen varieties of Beans were grown, all of which have been in cultivation on this farm for a considerable time. A great many of these varieties had been discontinued for one reason or another. All available varieties were collected from old stock with the result that, in many cases, the germination was particularly bad as can be seen from the table of results below:—

Experiments in Nursery Plots.—(BEANS).

Variety.	Date of planting.	Previous crop.	Seed per acre.	Duration.	Date of harvesting.	Rainfall before planting.	Rainfall during growth.	Yield per acre.
Noyau au Blanc	12th May, 1920	Wheat	30 lbs.	133 days	21st Sept. 1920	14·84″	6·72″	450 lbs.
Flagelot ...	26th do	Beans	do	—	Failure	17·80″	—	Failure.
Rose Coco ...	21st do	Teff Grass	do	130 days	27th Sept. 1920	15·79″	5·77″	810 lbs.
Butter ...	12th do	Wheat	do	133 do	21st do	14·84″	6·72″	450 do
Flagelot ...	26th do	Beans	do	—	Failure	17·80″	—	Failure.
Soya ...	22nd do	Peas	do	157 days	25th Oct. 1920	15·88″	6 52″	630 lbs.
Stringless ...	12th do	Wheat	do	133 do	21st Sept. 1920	14·84″	6·72″	405 do
Horse ...	12th do	do	do	156 do	14th Oct. 1920	14·84″	7·22″	1,485 do
Horse ...	12th do	do	do	156 do	do	14·84″	7·22″	1,495 do
Canadian Wonder ...	14th do	do	do	126 do	16th Sept. 1920	14·84″	6·72″	1,215 do
Noyau au Blanc ..	25th do	ho	do	123 do	24th Sept. 1920	17 71″	3·85″	585 do
Canadian Wonder ...	1st June, 1920	do	do	116 do	do	19·72″	1·83″	720 do
Broad ...	12th May, 1920	Chickory	do	156 do	14th Oct. 1920	14·84″	7·22″	1,485 do
Broad ...	12th do	do	do	156 do	do	14·84″	7·22″	770 do
Canadian Wonder ...	14th do	Wheat	do	126 do	16th Sept. 1920	14·84″	6·72″	1,215 do

Peas. The same remarks apply to Peas as for Beans. Table of results below:—

Experiments in Nursery Plots.—(PEAS).

Telephone ...	17th May, 1920	Lentils	30 lbs.	130 days	23rd Sept. 1920	15·08″	6·48″	360 lbs.
Small Field ...	1st June, 1920	Fallow	do	114 do	22nd do	19·73″	1·83″	315 do
Telephone ...	12th May, 1920	Wheat	do	140 do	28th do	14·84″	6·72″	494 do
Cow ...	26th May, 1920	Mangolds	do	—	Failure	17·85″	—	Failure.

Miscellaneous Crops. Various other miscellaneous crops, of which a Table of record is given below, were planted with the same idea and very indifferent results with the exception of Lentils and Rye:—

Experiments in Nursery Plots.—(MISCELLANEOUS CROPS).

Variety.	Date of planting.	Previous crop.	Seed per acre.	Duration.	Date of harvesting.	Rainfall before planting.	Rainfall during growth.	Yield per acre.
Sugar Beet:								
Half-Rose ...	20th May, 1920	Beans	—	—	Failure	15·77″	—	Failure
Sugar Beet, White ...	18th do	Peas	—	—	do	15·44″	—	do
Turnips ...	20th do	Beans	—	—	do	15·77″	—	do
Lentils ...	13th do	Fallow	—	133 days	22nd Sept. 1920	14·84″	6·72″	1360 lbs.
Teosinte ...	2nd June, 1920	do	—	—	Failure	19·80″	—	Failure
Carrots:—								
Chantaney ...	20th May, 1920	Potatoes	—	—	do	15·77″	—	do
Carrots:—								
Belgian White ...	do	Beans	—	—	do	15·77″	—	do
Oats ...	do	Fallow	60 lbs.	141 days	7th Oct. 1920	15·77″	6·29″	900 lb.
Rye ...	29th May, 1920	do	20 do	132 do	do	17·80″	4·26″	1350 do
Rye ...	do	do	20 do	132 do	do	17·80″	4·26″	630 do
Rice ...	15th do	do	—	—	Failure	14·87″	—	Failure

Rotation Plots. The five acre rotation plot which has been carried over a period of years was discontinued after the harvesting of the second season's crop. A Table will be made out later shewing the results of these experiments over the years during which they have been carried out.

The undernoted Table shows the returns of the various crops:—

Rotation Experiments.—(1ST SEASON) 1 ACRE EACH.

Crop Variety.	Date of planting.	Previous crop.	Seed per acre.	Duration.	Date of harvesting.	Rainfall before planting.	Rainfall during growth.	Yield per acre.
Barley Wisconsin No. 6 ..	24th Mar, 1920	Potatoes	75 lbs.	171 days	17th Sept. 1920	7·49″	24·85″	324 lbs.
Beans, Rose Coco ...	26th do	Grass	30 do	137 do	9th Aug. 1920	7·49″	24·04″	500 do
Maize Hickory King ...	16th April, 1920	Barley	15 do	226 do	26th Nov. 1920	19·88″	20·09″	1500 do
Potatoes King of Early ...	29th Mar., 1920	Beans	1,280 do	156 do	31st Aug. 1920	10·52″	21·08″	Tons. Cwt. Qr. lbs. 2 15 1 12
Grass Teff ...	26th do	Maize	15 do	139 do	11th do	7·69″	26·84″	Hay. Seed. 2520 lbs. 90 lbs.
			(2ND, SEASON)		1 ACRE EACH.			
Beans Canadian Wonder	3rd Nov. do	Barley	30 do	104 do	14th Feb. 1921	3·06″	15·95″	658 do
Maize Fort Hall ...	do	Beans	20 do	175 do	25th Apr 1921	3·06″	25·92″	1326 do
Potatoes King of Early ...	5th do	Maize	1,280 do	110 do	2nd Feb. 1921	3·06″	16·97″	Tons. Cwt. Qr. lbs. 2 19 2 16
Grass Teff ...	6th do	Potatoes	15 do	101 do	14th do	3·11″	15·90″	Hay. Seed. 3227 lbs. 640 lbs.
Barley Wisconsin No. 6 ...	3rd do	Grass	75 do	123 do	5th Mar. 1921	3·06″	16·84″	1057 lbs.

Experiments, Stock. No work which can really be called experimental has been carried out with stock during the year unless one can include the change from Grade cattle to Pure Bred Stock brought from a clean area to an infected one.

Farm Work, General. The general farm work has been, apart from the experimental side, continued with the aim of growing seeds of proved crops for distribution to the farming community and also for use on the farm such as stock feeding.

Livestock and labour are under the immediate control of the Assistant Manager.

The work done on the farm in connection with the Flax, Horticulture and Coffee will be reported on by the various officers concerned.

We have been able, on the whole, to get all the labour we require or can afford. For field work, we engage and procure a regular supply of Akavirondo. Our cattlemen and coffee pruners are mainly drawn from our Squatters. Nandis have been imported as ox-drivers to replace the Kikuyu which change has been a decided improvement.

We are indebted to the Superintendent of the Reformatory for a number of inmates who are apprenticed on Flax work, as also we are for our office orderly.

Crops. The most important crop which we have grown during the year has been Wheat for which there has been a large demand for seed purposes. I regret, however, that our seed is not so true to name as is desired.

The most popular varieties and most rust-resistant are:— Cross No. 13/5, Cross No. 13; "Kabete Selected" and Florence.

A tremendous amount of damage was done to the Wheat crop by birds; even by employing a large number of children to scare these away, they still persisted in their work of destruction.

Maize. Only two varieties were grown during the year, viz., "Hickory King" and "Fort Hall Hybrid." In the first season the Fort Hall Hybrid was cut green. In the next season 6 acres of "Hickory King" were put into the Silo.

The greater part of this crop has been used for feeding stock, only a small quantity of selected "Fort Hall Hybrid" having been distributed for seed.

During the latter part of the year we received a quantity of five South African varieties, viz., 8-Row Hickory King; 12-Row Hickory King; Iowa Silver Mine; Potchefstroom Pearl and White cango, of which it is hoped, during next year, to grow a supply of pure seed of Potchefstroom Pearl and 8-Row Hickory King.

The returns of Maize will be found below:—

Field Plot Returns, 1920-1921. (MAIZE) 1ST SEASON 28 ACRES.

Variety.	Area.	Plot No.	Date of planting.	Previous crop.	Seed per acre.	Duration.	Date of harvesting.	Rainfall before planting	Rainfall during growth.	Yield per acre.
Hickory King ...	10 acres	6	21st April 1920	Flax & Wheat	15 lbs.	220 days	25th Nov. 1920	20·92″	18·44″	1,475 lbs.
Fort Hall Hybrid ..	1 „	7	25th May 1920	Barley	do	Cut green for cattle feed	—	28·56″	—	Cut green
Hickory King ...	1 „	15	16th April 1920	do	do	226 days	26th Nov. 1920	19·88″	20·09″	1,500 lbs.
Hickory King ...	16 „	Top.	9th March 1920	Wheat	do	249 „	12th Nov. 1920	2·16″	33·91″	1,578 „
						2ND SEASON	17 ACRES.			
Hickory King ...	6 „	4	19th Nov. 1920	Wheat	15 lbs.	Cut green for cattle feed	—	4·60″	—	Cut green
Fort Hall Hybrid ...	10 „	5	4th do 1920	Flax	20 „	175 days	26th April 1921	3·06″	25·93″	1,151 lbs.
Fort Hall Hybrid ...	1 „	15	3rd do 1920	Beans	20 „	175 „	25th do	3·06″	25·92″	1,326 „

Beans. In addition to the acre of Beans in the experimental rotation in Plot 15, five acres each of "Canadian Wonder" and "Rose Coco" were planted during the first season. These were planted late in the season and, having no rain, were a failure.

Peas. An acre of Peas was also planted, particulars of which will be given in the Table with Potatoes.

Potatoes. Five acres of Potatoes of established varieties here, viz:—"King of Early" and "Early White," were planted in the first season and 3 acres in the second season. These were grown without manure. The crop after harvest, stored very badly and the greater bulk of the crop was fed to Pigs.

I believe that the reason for the bad keeping may be due to the fact that the exposure to the strong sun, when dug up, may injure the cells and make them more liable to attack by disease.

Results of the crop are noted below:—

Field Plot Returns, 1920-1921. 1ST SEASON (PEAS) 1 ACRE.

Variety.	Area	Plot No.	Date of planting.	Previous crop.	Seed per acre.	Duration.	Date of harvesting.	Rainfall before planting.	Rainfall during growth.	Yield per acre.
Small Field Peas ...	1 acre	15	8th April 1920	Flax	30 lbs.	149 days	3rd Sep. 1920	14·60″	17·04″	760 lbs.
					1ST SEASON (POTATOES) 5 ACRES.					
										Tons. Cwts. Qrs. lbs.
King of Early ...	3 do	15	2nd do	Flax	1,280 lbs.	155 days	3rd Sep. 1920	12·16″	19·48″	1 1 0 18
Early White ...	1 do	15	1st de	do	do	153 „	1st do	15·03″	19·59″	2 5 2 14
King of Early ...	1 do	15	29th Mar. 1920	Beans	do	156 „	31st Aug. 1920	10·32″	21·08″	2 15 1 12
					2ND SEASON (POTATOES) 3 ACRES.					
Early White ...	1½ do	2	18th Nov. 1920	Fallow	1,280 lbs.	118 „	15th Mar. 1921	4·60″	15·60″	2 10 1 12
King of Early ...	½ do	2	do	do	do	120 „	17th do	4·60″	15·60″	3 10 0 20
King of Early ...	1 do	15	5th do	Maize	do	110 „	21st Feb. 1921	3·06″	16·97″	2 19 2 16

Sugar Cane. We have disposed of a considerable amount of Sugar Cane here for planting purposes.

Before commencing to cut out, and at two years of age, it was estimated to be carrying between thirty-five and forty tons of cane per acre.

A small acreage was planted with "Uba"; two methods of planting being used—one continuous single row and the other continuous double row planting.

Both appear to be doing well with a much better stand being got from the latter method.

Flax. During the first season an area of 22 acres was put under this crop and 23⅜ acres during the second season. This crop will be dealt with by the Flax Officer in his report.

Stock. At the beginning of the year, practically all the cattle on the farm were grades—mostly Grade Red-Poll. These were disposed of by Public Auction at a sale held on this farm on the 29th January, 1921, when very fair prices were realised. The average prices realised are given in the following table:—

	Each Averaged Fls.	Cts.
Ayrshire Bulls	375	00
Grade Red-Poll Cows with calf and in calf ...	233	00
Grade Red-Poll Heifers	145	00
Grade Friesland Cows, with calf and in calf ...	282	50
Grade Friesland Heifers	182	50
Grade Ayrshire Cows, with calf and in calf ...	262	50
Grade Ayrshire Heifers	123	75
Other Cows (old)	74	00
Oxen (old)	68	00
Pigs, "Berkshire" Sows	140	00
Pigs, "Berkshire" Boars, Young	38	30
Pigs, "Berkshire" Sows, Young	48	65
Pigs, "Large Black," Boars, Young	27	00
Pigs, "Large Black," Sows, Young	79	00
Pigs, "Tamworth," Sows	70	00
Pigs, "Tamworth," Sows, Young	145	00
Sheep	18	80

After the sale we received:—8 Pure Bred and 2 Grade "Friesland" and 10 Pure Bred "Ayrshire" Cows, with 1 Pure Bred "Friesland" Bull and 1 Pure Bred "Ayrshire" Bull. All this stock came from the Government Stock Farm at Naivasha, but the "Friesland" Bull had been imported recently from South Africa. These cattle were regularly dipped and hand-dressed from the time of their arrival and we have had only one death from East Coast Fever.

A new span of oxen was brought in April 1920, and a further span was brought in February 1921, to replace the old oxen which we sold in January, 1921. These oxen have done very well.

All our cattle were inoculated against Pleuro-pneumonia on the 9th November, 1920.

Throughout the year, the general health and condition of cattle was good, with the exception that towards the end of the year, they went off condition slightly on account of the poor state of the pasture due to drought.

During the year we sold all cross-bred pigs on the farm and some Pure Breds which were not up to standard.

We also received 4 pedigree "Berkshire" Sows and 4 pedigree "Large Black" Sows from South Africa in December 1920. These are doing very well.

The horses and mules have done very well, the horses being in work practically every day.

Throughout the year the total losses, in all classes, through deaths was 15 details of these are given below:—

Deaths in Live Stock, 1920-1921.

Class of animal.	East Coast Fever.	Hoven.	Pneumonia.	Aged.	Ruptured Stomach.
Grade Red-Poll Calves ...	2	—	—	—	—
Grade Friesland Cow ...	1	—	—	—	—
Working Oxen ...	—	2	—	—	—
Sheep ...	—	—	5	—	—
Lambs ...	—	—	3	—	—
"Berkshire" Sow ...	—	—	—	—	1
"Tamworth" Boar ...	—	—	—	1	—
Totals .	3	2	8	1	1

At the end of the year the farm was carrying:—

	No.	Totals
Pure Bred Ayrshire Cows	10	
Pure Bred Ayrshire Calf	1	11
Pure Bred Friesland Bull	1	
Pure Bred Friesland Cows	8	
Pure Bred Friesland Calves	3	12
Grade Friesland Cows	2	2
Grade Red-Poll Calves	2	2
Working Oxen	62	62
Total number of cattle ...		89
Pigs, "Berkshire" Boars	2	
Pigs, "Berkshire" Sows	7	
Pigs, "Berkshire" Young	5	14
Pigs, "Large Black" Boars	2	
Pigs, "Large Black" Sows	7	9
Total number of Pigs ...		23
Mules	8	8
Horses	2	2

I have further to add that it was found necessary to supplement the grazing by such other foods as were available at the time.

Cows with calf have had, twice a day at milking time, a mixture of crushed maize, cut green maize and cut sugar cane or crushed maize with either of those, alone, or crushed maize and ensilage.

The mixture given contained 6 lbs. of crushed maize and, approximately, 10 lbs. of the bulkier food, per head per diem.

At the beginning of the year Naivasha hay was given to all stock.

The oxen, while on hard work, received approximately 10 lbs. per head per diem, of ensilage and sugar cane, with satisfactory results.

Buildings and Improvements. No new buildings have been erected during the year. Certain necessary minor repairs to buildings have been carried out by the P.W.D., and ourselves.

A considerable amount of work has been put in in repairing the roads throughout the farm and making a new one to the Hostel.

A new retting tank was built for flax. The work in connection with this was done by the apprentices from the Reformatory under the supervision of the Superintendent.

A five-berth scutching mill, imported from Ireland, was erected as well as a six-pair set of rollers.

The power used for the Flax Factory at the beginning was our own oil engine. Finding this type of power too costly, we brought a new steam engine which we find very satisfactory for driving all farm machinery.

A telephone line has been put in to connect us up with the Veterinary Pathological Laboratory, from which we can get through to the Nairobi Exchange, and in addition, a line connecting us to the Entomological Laboratory. This is undoubtedly an acquisition but it is not as satisfactory as we could desire as the Veterinary Laboratory requirements almost monopolise the line to the exchange.

The office was moved from the store building to an old wood and iron building. This was necessary for accommodation of the increase in work and staff.

The farm has been equipped, practically throughout with new agricultural implements to replace those old and worn out.

Correspondence. The correspondence covers a very large variety of agricultural subjects, relating to tropical, sub-tropical and temperate crops.

An analyses of the correspondence for the year is given below:—

	Inward.	Outward.
Crops and Seed Applications, etc. ...	541	624
Stock	99	104
Labour	17	24
Stores and Accounts	414	430
Revenue	36	39
Expenditure	7	5
Pupilage and Hostel	55	53
Foodstuffs	9	7
Miscellaneous	132	208
	1,310	1,494

Resumé of Farming Condition. Very favourable weather conditions prevailed throughout the year.

Weather conditions during the planting, growing and harvesting times were extremely good.

At the beginning of the year there were 73 Squatter families on the farm. In February,1921, we in conjunction with the District Commissioner, Kyambu, ordered 27 families to leave the farm. The reason for this was that these men, or their families, were working elsewhere while their goats and sheep were occupying our land.

The purchase of new oxen and implements have made better farming conditions possible of which every advantage has been taken.

Below will be found a summary of the Revenue for the year as well as a summary of Free Issues of Seeds, etc.:—

SUMMARY OF REVENUE: 1920-1921.

Seeds	Fls.	Cts.
Barley	106	00
Beans	7	00
Coffee	1,049	05
Flax	2,491	22
Teff Grass ...	18	75
Maize	53	34
Peas	21	25
Potatoes	252	45
Wheat	673	44

	Fls.	Cts.
Total for seeds	4,672	50
Fruit	16	75
Fruit Trees	323	20
Miscellaneous Produce (Including Sugar Cane, Banana suckers, etc.)	582	07
Sale of Live Stock	19,907	24
Sale of Stores (Sacks and Crates)	94	15
Collected for Carriage of Goods	25	77
Collected for "Upkeep of Farm"	72	00
Fls.	25,693	68

VALUE OF FREE ISSUES 1920-1921.

	Fls.
Barley	4
Flax	15
Rye	10
Wheat	50
Fls.	79

Requirements. The requirements of the farm are many.

Farm Buildings and Staff Quarters are urgently required; nothing having been done in this direction for years.

A water supply is even more necessary. Considerable losses in Plants and Coffee Nurseries have been caused through lack of sufficient water supply. This had to be carted from the Spring. A sufficient supply by this method is absolutely impossible as water for domestic purposes for the whole staff and Students in residence has to be carted when the rain-water tanks are exhausted. A survey and estimate has been prepared by the Hydraulic Engineer which is in your hands.

New Native lines should be erected.

More sleeping accommodation is required at the Hostel.

A more satisfactory telephone service is required. This can be attained by the installation of a wire direct to exchange which could also be shared by the Entomological Department, thus relieving the congestion on the Veterinary Pathological Laboratory wire.

Number of new seeds such as Maize and Potatoes are required.

Forecast for Next Year's Work. A certain amount of the coffee will be stumped back to eight inches, some will be removed altogether and the rest heavily pruned in accordance with the Coffee Officer's instruction. New washing tanks will be made.

Varieties of Maize, imported from South Africa, will be planted with the object of obtaining pure seed for distribution. During the first season, these will be "Potchefstroom Pearl" and "8-Row Hickory King."

All our other crops, such as wheat, will be grown with the same object.

Experiments in the feeding of Pigs on various feeding mixtures will be carried out.

With regard to Potatoes, it is hoped to import and experiment with new varieties and also to raise some from seed.

A further piece of land will be broken up to produce a larger amount of foodstuffs for live stock consumption on the farm.

It is anticipated that lecture courses, for new Settlers and others, will be held as circumstances require.

A. J. WILSON,
Manager.

Appendix I.

ANNUAL REPORT

OF THE

Flax Instructor,

FOR THE YEAR ENDED

31st March, 1921.

The Hon. The Director of Agriculture, Nairobi.

through

The Manager, Kabete Farm.

Sir,

I have the honour to submit herewith my annual report for the year ending 31st March, 1921.

General. The year may be characterised as one of marked development in flax production in Kenya Colony as regards quantity and particularly quality and general handling of the flax crop in the various flax districts, from the preparation of the land and sowing, to the baling of the Flax and Tow for export. Although many flax producers, during the year, lost considerably financially, owing firstly to the world-wide slump in which the Kenya flax industry was not the only sufferer, and secondly to the destruction caused by the flax caterpillar. Still it is satisfactory to note that signs are not wanting to show that the worst depression that has befallen the flax industry for many years is nearing an end, and it is hoped that the worst time for the Kenya flax grower has already been passed.

Although large stocks of flax and tow are still held by Kenya growers; both in the home country warehouses and in this country; several recent sales have taken place at prices which are quite remunerative at to-days's cost of production, but perhaps unremunerative when one considers the high cost of production caused by the heavy overhead charges in existence on so many estates about a year ago: the enormous cost of seed: railway and ocean freights and also native labour.

For the sake of comparison it is encouraging to note that the cost of seed in April 1920 was approximately Fls. 50 per load of 60 lbs., as against to-day's price of Fls. 5. Thus, if taken at 10 acres to the ton of flax, the cost of production is reduced by, approximately Fls. 450 per ton by the reduction in the cost of value of seed alone.

Similar conditions apply to railway and ocean freights. A year ago it took about £35 to land one ton of flax, c.i.f., Belfast from Nakuru Station and, to-day the cost is well under £15 per ton, c.i.f. Belfast from the same station and native labour has also become less expensive and more efficient.

It will be seen from the above reductions in the cost of seed, railway and ocean freights, etc., that the grower is in a very much better position to-day as regards production and marketing costs when compared with a year ago and therefore is better off with a much lower price than the average ruling in 1920.

Flax seed as I have mentioned above, has dropped to a very low price and it is for this commodity that growers at present find it hard to obtain a profitable market.

However, the Department of Agriculture is giving the question of linseed export serious consideration and it is hoped shortly, with the aid of improving market prices, to work up an export trade which, even if the margin of profit is small when combined with the flax and tow returns, should make flax a most profitable crop to grow.

It is very satisfactory to be able to report the vast improvement in the general handling of the flax crop and its products in the various stages and particularly in the resultant fibre and tow. This has been very noticeable during the past year, thus proving that with practice both growers and natives are quickly becoming expert in flax production.

One of the greatest drawbacks, if not the greatest, to the flax industry in Kenya is the prevalence of the flax caterpillar which has been the cause of the destruction of practically all the flax sown in some districts and even in two successive seasons. With the object of eliminating this pest, the Entomologist and his staff have done some valuable experimental work on flax infested with caterpillar at Kabete Experimental Farm and the results of a powder spray seem promising.

It is worth noting that the flax caterpillars prove more prevalent and destructive during a season in which the rains may fail or in districts which are subject to a light rainfall. With favourable weather conditions during the earlier part of its growth, flax would be sufficiently well established to resist, to a great extent, the ravages of various pests and diseases.

I have noticed that, at altitudes of 7,000 feet or over, the caterpillar is rarely very destructive and I am therefore inclined to pick out the higher altitudes and the wetter districts for a sure crop of flax.

Instruction and advisory work.

During the year, this section of work claimed a good deal of attention and every opportunity that presented itself was taken advantage of to keep growers informed and instructed in the details of the production of fibre.

For this purpose eight tours of instruction were carried out occupying 185 days and visiting on several occasions were paid to the majority of the flax growers in the following districts:—

Nairobi, Kyambu, Gilgil, Nakuru, Solai, Njoro, Rongai, Londiani, Lumbwa and Kericho, and also one tour in the Uasin Gishu and Trans Nzoia districts.

During the above tours as many flax farms and factories as possible were visited. Land, flax crops, flax fibre, seed, stores and machinery were inspected and advice given on the spot. Appreciation was generally expressed for the efforts made.

The erection of some twenty-two new flax factories throughout the country during the year incurred a lot of work in the way of factory instruction, setting and adjusting of machinery, etc.

It is a pleasure to record appreciation of the kindness and consideration shown by the settlers of the various districts visited and also of the assistance given in any difficulty in obtaining transport.

Correspondence. The number of letters dealt with during the year was:—575 inward and 621 outward, 80% of which were of an advisory nature, the remainder consisting chiefly of reports on flax straw, seed, fibre, tow, scutching, seed cleaning; and machinery, etc.

Experiments conducted at Kabete Experiment Farm. During the year under review the area under flax consisted of 22 acres during the long rains and 23¾ acres during the short rains 1920.

Flax varieties.

English Dutch Child.
Japanese.
Canadian Ontario.
Canadian Western.
Dutch 3rd year. Kabete.
Government Imported seed.

These were planted under comparative trials, and certain definite conclusions may be drawn from the exhaustive tests carried out. The yield of straw and of seed per acre was determined. Thereafter the behaviour of each variety under water retting and under dew retting was ascertained. Yields of fibre were secured.

Finally financial returns based on the quality of the product and the yield thereof were worked out for each variety, the whole representing a complete series of trials which gives definite data for discussion and consideration.

The results summed up are:—

that English Dutch Child gave the highest return in that the percentage of flax to straw was greater and the fibre yield was also highest.

The superiority of Dew or Rain Retting over water retting was amply demonstrated.

At ruling market prices the return is sufficiently great to make the crop remunerative.

Flax Retting Experiments. Trials to provide definite comparisons between Dew and water retting were carried out. Eleven sets of experiments were designed and fifyt-eight separate tests were made.

They included the restriction and expansion of the area of spread in Dew retting; various forms of water retting, and also mixed retting.

Shortly the conclusions arrived at are that:—

(*a*) Water retting under all the different methods tried was a comparative failure.

(*b*) The retting of green flax has not proved satisfactory.

(*c*) Mixed Dew and Water retting also failed to commend itself; the system although rapid, being very wasteful.

(*d*) Dew and Rain retting under the various methods of spreading appeared to be the best system to pursue.

Line Breeding of Flax. A commencement with line breeding of flax with a view to improving strains was made.

Lectures and Demonstrations. During the month of July six lectures and six practical demonstrations in flax cultivation and preparation were given to ex-Soldier Settlers resident at the Kabete Hostel which should be of use to them in practical flax work.

Throughout the year approximately 100 students were in residence at the Hostel for shorter or longer periods; most of these took a working interest in the various flax operations going on at the time of their visit.

Machinery. During August 1920 a small five berth flax scutching plant, including a six-pair set of breakers, by Messrs. Taylor & Co., Strabane, Ireland was erected and after several unsuccessful attempts with an oil engine belonging to the farm, and another loaned from the Public Works Department, for the supply of power, a Ransome's steam engine was installed in March 1921, and has since given every satisfaction, the waste of "shove" from the factory being used as fuel.

Training of Natives in Scutching. Altogether about 58 natives were sent here for training in flax scutching, seed cleaning, etc., during the year, from various Settlers who were starting their own factories and were anxious to begin with "boys" skilled in flax scutching.

While at Kabete these boys have been taught as carefully as possible, but it should be noted that only about sixty-five per cent. of these boys will ever be successful scutchers owing to physical inability to withstand the dusty atmosphere of the scutching factory.

I have the honour to be,
sir,
Your obedient servant,

GEO. M. HAMILTON,
Flax Instructor.

APPENDIX J.

ANNUAL REPORT

OF THE

Horticulturist,

FOR THE YEAR ENDED

31st March, 1921.

THE HON. DIRECTOR OF AGRICULTURE,

THROUGH THE MANAGER, KABETE FARM.

I have the honour to submit herewith my Second Annual Report for the year ending on the 31st March, 1921.

Tours of Inspection. During the year 1920-21, 85 days were spent on safari visiting the following districts and giving instructions in general Horticultural work:—Limuru, Ngong, Kabete, Kyambu, Nakuru, Njoro, Machakos, Mua Hills, Muthaiga, Athi River, Ruiru, Fort Smith, Rongai, Gilgil, Solai, Molo, Lumbwa, Thika, Donyo Sabuk, Kikuyu, Uplands, Kericho, Koru, Kisumu, Kibos and Nairobi.

From December 12th to 14th, I was at Nakuru on duty in connection with the Agricultural and Horticultural Show.

Only a few farmers are growing fruit on a commercial scale; many of them are keen on fruit growing, but where fruit was grown in small quantities neglect of pruning and cultivation was observable.

Frequently, in cases where orchards have changed hands, all records of the varieties of the trees have been lost.

It is important that farmers, owning orchards should make plans of their orchards when planting, as the labels attached to the trees on arrival frequently get lost.

In all the districts farmers were eager to procure any knowledge of pruning and the care of the trees.

Kabete—Distribution of Plants and Seeds. The following fruit trees, fruits and cuttings, etc., were issued and sold during the year:—

Plum trees	...	203
Peach trees	...	100
Grape vine	...	1
Banana suckers	...	78
Budwood	...	11 packages.
Kei Apple cuttings	...	1 ,,
Manila hemp	...	100 suckers.
Orange fruits	...	1¼ cwts.
Lemon fruits	...	2½ ,,

Seeds and Plants Imported for Experiment.

Pyrethrum Roseum. This germinated and is doing well. It was grown from seeds received from Messrs. Sutton & Co., England.

During November seventeen different varieties of seeds of economic and ornamental plants were received from the Royal Botanic Gardens, Peradeniya, Ceylon. Half of the contents of each packet were sent to Mazeras Farm and the other half planted here. Up to the present two of these have germinated, viz:—"*Cassia grandis*" and "*Caesalpinia Plucherima.*" *Castor Oil*:—One rust resistant variety was received from Pretoria. This has developed rust.

One from India has also developed rust which the Mycologist identifies as "*Melampsorella rinci.*"

Fruit trees. The following fruit trees arrived from South Africa during August 1920:—36 Plums, 36 Apples, 3 Japanese Persimmon and 6 Avocado Pears. These arrived in the dry season and entailed an amount of labour in watering, etc. The Persimmon and Avocado Pears were new to the farm and are growing well.

Kabete Orchards.

Apples. These have made good growth since last year. The following varieties have borne fruit:—"Lord Wolseley," "Charles Ross," "Smiths Cider," "Blenheim Orange," "Balarat Seedlings," "Watsonville Special," "Scarlet Pearmain," "King of Tomkins County," "Warner's King" and "Stone Pippin."

Pears. "Keiffer Hybrid" is doing well but has not yet fruited.

Quince. (*Cydonia oblonga*). The variety "Cape Selected" fruited best.

Loquat. (*Eriobotrya japonica*). These flowered in May and fruited in July and bore an exceedingly heavy crop. Two varieties had superior flavour to the others. The seeds of these have been saved for sowing in the nursery.

Plums. The following varieties fruited at Kabete; the variety "Kelsey" bore the heaviest crop:—"Satsuma," "Pissardi," "October purple," "Kelsey," "Burbank" and "Sultan."

Cherry. "Black Bigareau" has made little growth and has not fruited.

Apricots. These are making good growth but have not yet fruited. It is expected that they will fruit next year as they are now bearing fruit buds.

Peach. The following varieties of Peaches gave heavy crops of fruit of good size and quality:—

"Waldo" flowered in June and fruited in January.

"Angel" flowered in June and fruited in January.

"Florida Crawford" flowered in June and fruited in February.

"Peen-too" flowered in August and fruited in January.

"Palas" bore few fruits.

"Peen-too" was root-pruned to encourage better fruiting.

Almonds. These bore good crops this year; the varieties I x L and "Paper-shell" being best.

Fruits Sub-tropical.

Figs. The varieties, "White adriatic" "Madeline" fruited but were attacked by birds. Many of the trees were attacked by borers. These were cut down and replaced by young palnts.

Mulberries. These fruit well. The Indian species is grown on most farms. The English Mulberry might be introduced more into cultivation.

Cherimoyer. (*Anona cherimola*). Two young plants are growing.

Custard Apple. (*Anona reticulata*). The four trees have fruited well.

Guava. (*Psidium guajava*) fruited but was attacked by birds.

Mango. (*Mangifera indica*). These fruited well but did not develop.

Cashew Nut. (*Anacardium occidentale*). Seeds of these were sown and germinated, but died off.

Persimmon. Diospyera virginiana). Three young plants of these, imported from South Africa, are growing well.

Brazil Nuts. (*Bertholletia excelsa*). Seeds of these were sown but did not germinate.

Date. (*Phaenix dactylifera*). Two Date Palms are growing.

Pomegranate. (*Punica granatum*). This grows and fruits well here and is used largely for making hedges.

Paw-paw. The giant Paw-paw succeeds well here and bears fruit.

Avocado Pears. (*Persia gratissima*). Young plants, which came from South Africa, are doing well.

Vines. (*Grape*). These are subject to mildew, probably due to being planted near the trees. Most of the varieties bore fruit but did not develop except "Crisault," "Morastel" and "Alicante" which bore good bunches.

Granidilla. (*Passiflora edulis*). Does well.

Banana. Five varieties are grown here. A new plot was planted from suckers from the old plot.

Manila Hemp. Six rows of Manila hemp were planted.

Pineapple. A plot of three varieties of suckers have been planted, viz, 1 "Smooth Cayenne," 2 "West Indian Variety" and 3 variety from Mazeras.

Cape Tomato. (*Cyphomandra betacea*). Fruit well at Kabete.

Citrus Fruits.

Oranges. These fruited well and were at their best in July and August. Varieties in order of merit are as follows:— "Washington Navel," "Joppa," "Jaffa," "Mediterranean Sweet" and "Thompsons Improved Navel."

Mandarines. The Bombay is the best.

Citron of Commerce. Fruited heavily.

Lemons. These carried heavy crops. The "Villa Franca" bore the heaviest crops, but the fruits of this variety are deformed as a rule and have thick rinds and many of them develop into an abnormal size. "Eureka" has proved satisfactory but the best is the "Sicilian" variety which has a thin rind, is juicy and of medium size. "Genoa" are of medium size fruits and of good shape.

Limes. "Tahiti" limes bore heavy crops and "St. Dominica" are slow in growth and have not yet borne any fruit.

Grape Fruit. "March's Seedling" bore heavy crops.

Naartjes. "Cape" bore good crops but the trees do not do well at Kabete. They suffer from die-back.

Kabete Nursery.

Cuttings of various fruit-trees were put in. Seeds of Rough Lemons were planted. Owing to the furrow drying up many of these were lost.

Diseases and Pests.

A certain number of Lemons were badly attacked by Red Scale (*Chrysomphalus aurantii*); Purple Scale (*Mytilaspe's bechii*) and Ivy Scale (*Aspidiotus hederoe*) the latter which was chiefly on the fruits. These trees were sprayed with "Harbas," one part in forty. The scale is now almost eradicated but with periodical spraying it is hoped to keep the trees free from scale.

Vines. The vines were attacked by mildew and were treated with sulphur.

Figs. These were attacked by borers and were cut out and replaced by small plants.

Birds attacked the fruits of peaches, plums and figs. The former were attacked chiefly by a small red finch.

Instruction to Settlers.

During June I gave six lectures on Horticulture to the Soldier Settlers at the Hostel at Kabete as follows:—

June 11th: No. 1. Fruit Growing in B.E.A.

June 12th: No. 2. Tropical and Sub-tropical fruits.

June 15th: No. 3. Citrus varieties.

June 18th: No. 4. Citrus. Budding, grafting and propagation.

June 19th: No. 5. Pruning of Citrus and Deciduous Trees.

June 28th: No. 6. Citrus. Lining out, Planting of and Irrigation, etc.

Coffee.

On the 17th March, 1920 I took over charge of the Coffee at Kabete as Mr. Trench was proceeding on leave.

Seed of "Blue Mountain" variety was collected and seed beds were made.

Stumping of the Arabian Coffee was carried out on Plot No. 12 on the main road and also in the plot on the Top Ridge.

C. B. USSHER,
Horticulturist.

APPENDIX K.

ANNUAL REPORT

ON THE

Economic Plants Division,

FOR THE YEAR ENDED

31st March, 1921.

MOMBASA,

April 20th, 1921.

THE HON. DIRECTOR OF AGRICULTURE,

NAIROBI.

I have the honour to submit herewith my report on the Economic Plants Division for the year ending April 1920-21.

2. I assumed duties as Chief of the Division during February of last year and made Mombasa my Headquarters.

3. The weather conditions during the period covered by this report were good, that is speaking comparatively, for the three years previous to 1920 were of short rainfall and 1918 was almost a famine year. During the year under review agricultural production reached something like normal. Indeed the weather conditions during the latter part of the year were more favourable to crops than had been experienced for many years.

4. *Re-organisation.* The work of the Division had in recent years suffered from lack of supervision owing to war conditions, so that it was found necessary to reorganise the work considerably, but this was not easy as the staff consisted of only two Agricultural Instructors. The Foreman Plant Instructor being seconded for Beetle Trap work, was not available for work in the Division, at least not for the greater part of the year.

5. *Kibos and Mazeras Farms.* As requested by you I submitted reports on both farms soon after taking up my duties here. The report on the Kibos Farm embodied suggestions for the carrying out of intensive experimental work. The suggestions were of course applicable to both farms. Hitherto the work consisted largely in laying down various crops for seed distribution. There was a lack of system not only in the experimental work but in the keeping of records, and in the general working.. It was found necessary to lay down definite lines of procedure in order to obtain reliable records and to co-ordinate the work of both farms.

The procedure suggested in that report was generally agreed upon and written instructions were issued to the respective Managers. In addition the farms were visited periodically and verbal instructions given. Thus operations have proceeded along the lines laid down, as far as circumstances have permitted.

Food crops are of prior importance and much of the experimental work now being undertaken is in connection with them. A number of native crops have been collected for testing and improvement, including 43 varieties of bananas, 12 varieties of "Sweet" potatoes, and ½ doz. or more varieties of "Cassava." These are in addition to the local varieties.

6. *The Kavirondo Province.* In addition to the management of the Kibos Farm, the Manager has to undertake native agricultural work in the Kavirondo Province. It is an extensive Province and varied in character and could well take up the whole time of an Agricultural Officer. I had the opportunity during September of last year of touring the Mumias District of the Province, and the numerous shambas and the thick population, and the fertile soil provided a very encouraging aspect, far more encouraging than can be found anywhere on the Coast.

There is considerable scope, it would appear, for increasing the production of economic commodities among the natives of that region without endangering the production of adequate food supplies for their own consumption. The aim is, however, in the meantime to increase the production of Rice, Groundnuts, and foodstuffs other than those they already grow, and for which there is a demand in the Colony and for export. With this end in view the following seeds were purchased and distributed to the Province.

Seed Rice 12 Sacks. Seed Groundnuts 80 loads. Details of distribution are given in the Kibos Farm report.

Besides these, 50 lbs. of Ginger Roots and 20 lbs. of "Pojo" (*Phascolus mungo*) have been sent to the farm for rearing of larger stocks for distribution at a later period.

7. *Agricultural Instruction.* For some years now a sum has been granted for the training of natives of the Province in agricultural pursuits. This training was undertaken at the Kibos Farm under the Manager. It is doubtful whether the scheme has been successful, for most of the pupils drifted away before they had obtained in any way a complete training. The "bookish" native is not the type of man for agricultural training, at least in his present stage of development, but rather the ordinary intelligent peasant with an elementary education, who is able to absorb the rudiments of agriculture and who will return to his farm at the end of the time and put into practice his newly acquired theories. A number of such men have now arrived on the farm and are comfortably housed with their wives.

8. *Coast Region.* Apart from what has been done with the rice crop, which is dealt with under that head, and the work of the farm at Mazeras there is nothing else to report on in the Coast region.

9. *Coconut Industry.* There is however, the Coconut Conference which dealt with and cleared up the ambiguous features of the ordinances affecting that industry.

It is obvious to those with a knowledge of the Coast that the native Coconut industry is of a low standard and that until the Coconut ordinance becomes law it is useless to expect improvement.

Most of the shambas are rarely if ever weeded; there is ample Beetle breeding material everywhere and large areas of coconut trees are merely "tembo" producers.

10. *Copra Industry.* With a view to ascertaining in what way the Department might help in the improvement of native Copra and in increasing output certain exporters of this commodity were interviewed and the matter discussed.

11. *Rice Investigation.* One of the most important duties undertaken during the year was investigating the possibilities of increasing rice production in the Coast regions of Sabaki, Vanga and Tana River. The matter had previously come within the scope of the Food Famine Committee during 1918. Their investigations, however, applied only to the Sabaki Region.

Rice growing in these regions is an industry of long standing but the output has never been very great and latterly it has, if anything, decreased.

The Customs figures given below will show what the position is with respect to native output and compared with the rice imports which are also given show it to be a mere negligible quantity.

Paddy inported to Mombasa from Coast ports.

	Vanga.	from Malindi (Sabaki)	Lamu (Tana River).
	Rs.	Rs.	Rs.
1914 ..	1,295	Nil	Nil
1915 ...	Nil	260	338
1916 ...	Nil	585	80
1917 ...	Nil	6	Nil
1918 ...	10,376	Nil	Nil
1919 ...	4,618	3,427	Nil

Rice imported to Mombasa, Malindi, Lamu and Kismayu:—

	From Foreign Countries.	
	Cwts.	Rupees.
1914-15	160,746 ...	1,256,953
1915-16	107,047 ...	876,313
1916-17	118,728 ...	1,111,166
1917-18	166,020 ...	2,034,675
1918-19	210-723 ...	3,212,969
1919-20	80,941 ...	1,405,077

It will be seen at once that the imports represent a very formidable annual expenditure for one of the principal foods of the Colony produced from outside sources, and it is to be regretted that the result of investigations with regard to this commodity on the Coast, do not point to the possibility of reducing these imports to any appreciable degree.

The Tana River region is of the three rice growing areas probably the largest producer of paddy, but this does not mean much for the exports from that place are practically nil, as most of the rice produced in the river is consumed in that region, mostly in Lamu.

Below will be found the exports for the last 8 years from Kipini which lies at the mouth of the river.

	Exports of Paddy from Kipini, Tana River.	
	Gislas.	Tons.
1913-14	719½ ...	91.543
1914-15	119¼ ...	15.172
1915-16	978¼ ...	124.464
1916-17	741¾ ...	94.370
1917-18	668½ ...	85.143
1918-19	9¾ ...	1.208
1919-20	367¾ ...	46.694
1920-21	1,662½ ...	211.076

These are very small figures in view of the fact that the Colony can absorb approximately 10,000 tons as it did during 1918-19.

Both the Sabaki and Tana regions have been visited, the latter on three different occasions and reports have been submitted with suggestions as to what should be done to encourage production. Vanga has yet to be visited and reported on. Although, as has been remarked, we cannot hope to produce sufficient rice to meet our own requirements, any efforts put forth to increase production as far as is possible is justified, provided results are compatible with the expenditure and effort. The operations which have been set on foot in this connection during the year are of a tentative nature and can be extended should they prove successful.

What has been done in a practical way has been the buying up of seed rice for distribution on easy terms to the peasant rice growers. £30 worth of seed has been bought up in Vanga, Kilifi and Sabaki areas and £35 in the Tana River, that is to the value of £125 in all.

As stated before the Tana River is the most promising of the three rice growing regions of the Coast, for there the requisite conditions for growing rice exist over a far wider area than in the other places.

On the Sabaki and Kilifi the rice grower depends largely on the rain to form swamps in which he plants his rice; on the Tana River the overflowing river provides the necessary conditions.

By means of irrigation large stretches of land on the Coast could be rendered suitable for rice culture, such as for instance the Garaski and Mbcani Plains on the north bank of the Sabaki and also numerous plains up the Tana River which are not affected by the floods, or are not inundated sufficiently long to ensure the success of a rice crop.

But owing to the paucity of population in these areas there would be no object in adopting irrigation measures. Indeed there are parts suitable for rice not peopled at present and those parts which are inhabited are not extensively cultivated. This lack of population is the whole difficulty in rice production. The people of the Tana River, that is the rice area and parts in its vicinity are estimated at 10,000; which figure includes children and those natives not employed in the rice fields. The figures for Sabaki are not to hand but that area is poorly inhabited.

To raise the rice industry of the Coast from its present small proportions to one capable of supplying the needs of the Colony would require an immediate influx of people. This was a measure adopted by the Government of British Guiana, which enabled that country in a comparatively short time to produce sufficient rice to meet its own needs, which are very large, and to become an exporter of that commodity.

Sugar Cane. Numerous letters and enquiries have been dealt with during the year with regard to this crop, and more orders for seed cane have been received than it has been possible to fill. The enquiries have come from all parts of the Colony and indicate that the planter is concerned with what type of cane he should plant. Where the conditions prevailing were known to suit the soft thick canes he has been advised to plant that type. Hitherto "Uba" had been planted indiscrimately. For the manufacture of "Jaggery" sugar there is no use in planting this type if the locality is suitable for the soft varieties. "Uba" is always more difficult to crush than the others and it will be found to take longer to sugar in the juice and will yield less.

Fortunately the Colony possesses large, very fertile areas admirably suited for the sugar crop with fine transport facilities; for example:—Tanaland, Sabaki and Vanga provide water transport and the Railway cuts through the Tsavo plains. These are the pick of the sugar growing areas, and they lend themselves to close settlement by small holders with central factories or to the larger holder.

As a guide to those taking up sugar cultivation, a printed bulletin dealing with the crop has been issued by the Department for distribution.

Fruits.

Coast Mangoes. With a view to establishing a comprehensive collection of tropical fruits on Kibos and Mazeras Farms, seed of most of the Coast Mangoes were got together and sown. Besides the "Dods" or "Rupiya" mango, there are others which are quite good table fruits. Besides they vary somewhat in their fruiting seasons, and with a view to ascertaining what other favourable characters the respective varieties may possess, it is proposed to have these varieties budded or grafted on the common King mango as a stock. This variety is widely distributed on the Coast and although a poor fruit, is of strong and hardy nature.

A description of the fruits of Coast mangoes was made.

Conclusion. In the course of the year a considerable amount of correspondence has been dealt with on various agricultural matters.

The Beetle traps work which was taken over during the early part of the year has been completed and the traps are in the course of being demolished.

During the district safaries in connection with agriculture much assistance has been rendered by the Administrative Officers with whom one came in touch; it has been a pleasure to meet and co-operate with them.

T. D. MAITLAND,

Chief Economic Plants Division.

Appendix L.

ANNUAL REPORT

ON THE

Experiment Farm, Mazeras,

FOR THE YEAR ENDED

31st March, 1921.

The Hon. Director of Agriculture.

through

The Chief, Economic Plants Division.

I have the honour to submit herewith the Annual Report on the Mazeras Experiment Farm for the financial year 1920-21.

Rainfall. The rainfall has been the highest since 1915 being 55 inches. The average for the last four years being 33.43ins.

A Meteorological outfit has been supplied and daily records are kept.

Staff. A new Native Overseer was engaged and took over his duties at the beginning of July, he has proved fairly satisfactory.

Prisoners and Labour. A number of prisoners were employed from the end of June till the 16th November, 1920, when they were removed to Mombasa. They were quartered in the Administration buildings at Rabai and were sent each day to the farm with an escort.

Their work which consisted principally of clearing was very satisfactory and their loss has been keenly felt, as it has curtailed the remodelling and the general development which was found to be necessary.

The native labour supply has been fairly plentiful but latterly has fallen off considerably as many men have been engaged in preparing their own shambas for the rains.

Office. The office work and correspondence were placed on a working basis. An inward and outward register established with a numbered system of files which has made all correspondence accessible at any time.

Remodelling. It was apparent that a definite system of sections and plots should be established, for facility in experiments and records. This work has proceeded on approved lines, which will embrace the whole of the farm, as development continues. Permanent iron labels have been obtained. Each label has its plot number, section and crop stencilled on it, also date of planting and a record book is kept in conjunction with the scheme.

Nursery. The Nursery has been considerably extended and the beds replenished from time to time, in accordance with the demands for plants, both economic and ornamental.

Distribution. The following numbers of plants, fruits and packets of seed have been distributed during the year:—

Economic plants	... 820
Economic seeds	... 67 pkts.
Ornamental plants	... 272
Ornamental seeds	... 36 pkts.
Coconuts	... 200
Oranges	... 1,450
Rice	... 2 loads.
Maize	... 32 loads.
Kapok	... 2 sacks.
Sweet potatoes	... 12 loads.

Cocaine. This plant seems to be of interest; a number of people have enquired for plants and seed.

Ramie. Ramie has also been in demand, the plant grows well and should become of economic importance provided machinery can be obtained to decorticate the fibre cheaply and efficiently.

The propagation of ornamental plants and shrubs and their packing takes up a good deal of labour which could be more profitably employed on the production of essential economic plants and stocks, as it is felt to be of utmost necessity to develop economic products in the country at the present stage of its existence.

Contributions. The following plants were received during the year from Kibos:—Muhogo varieties, Gwangwala, Nangwa, Matumbi, Kibibi, Dondi, Shelshel.

These are all growing well and directly a sufficient stock has been propagated it is intended to test them together with the local varieties.

Muhogo starch is of good quality but experiments are necessary to decide which are the best varieties for starch production early maturity, drought resisting, etc.

Groundnuts. Pondi Cherry, Spanish Peanut, Mauritius, Big Japan, Shirato.

Rice. Upland and Swamp.

Matama. Nyalando, Andiwo, Olieko, Orando, Mja Ka ngoya, Mja Thampiri, Mjasoga, Mjbandi.

CONTRIBUTIONS FROM WINKLESPRUIT, SOUTH AFRICA.

Sugar Cane. Demerara, Red B. 109.
,, D. 626.
,, D. 74.
Uba.

The first three varieties failed to germinate.

The Uba is growing well.

Bananas. Natal Red.
,, ,, Dwarf.
Ducasse Hybrid.

Arrowroot.—

Turmeric.—

Pineapples. Cayenne, Giant Queen and Golden Queen.

Sweet Potatoes. Southern Queen, Red Bermuda, Red Ceylon and Red Nancemaund.

Groundnuts. Viginian Bunch.

Cow Peas. Black Suyan—these failed to germinate.

Paw-Paw.—

Jute.—

Tobacco. Small packets of the following tobacco seed were received from the Tobacco Advisor for planting:—

Kavalla—Samsoun—Soulouk (Multi leaf).

Hybrid; Soulok x Kavalla.

Yaka.

Small packets of various Crotolarias and other plants for cover crops were received and duly planted. About four pounds of Liberian Coffee seeds from the Gold Coast were sent for trial. None of the seeds germinated although every care was taken with regard to the sowing.

INTRODUCTIONS.

Sweet Potatoes. Twelve types were introduced from Uganda and a number of local natives types have been planted in adjoining plots for comparison with regard to early maturity, yield, drought resisting powers, starch, content, etc.

Bananas. Eight varieties of Banana were obtained from Malindi:—

Mkono wa Tembo.
Wa-Kiume—this variety has a good fibre.
Farathi.
Mjaho (Red).
Mjaho (White).
Bofle.
Pukusa.

These together with the varieties already on the farm such as:—

Guindy—Dwarf Chinese—"Red"—Changamwe Natal Red —Natal Dwarf—Ducasse Hybrid and the Manila Hemp plant form a comprehensive collection for eventual distribution.

Arrowroot. The old plot has been cleared out and a new plot planted.

Arrowroot grows well here and gives a high percentage of good quality starch. The water supply, however, is not sufficient for any extensive tests.

Beans. Several dwarf varieties were grown but failed owing to an exceptionally long wet season. A few seeds of Canavallia Beans were procured and planted, these grew well and a quantity of seed has been saved for a further test.

Cotton. One acre of Caravonica Cotton was planted on the 6th December and although the wet season finished soon after that date excellent growth has been made and a few of the plants have flowered. The staple is of good quality and length.

Rice. One plot of "Kuyika" rice was planted and gave a fair return.

Several of the best local varieties have been obtained and the ground prepared for more extensive tests during the coming wet season.

Coconuts. The varieties of coconuts grown in the Coastal Belt have been collected and planted in the Nursery, in readiness to plant out in prepared plots when the weather is suitable, with a view to obtaining accurate records as to the best varieties for locality; copra and coir production; immunity to beetle attacks and length of time in maturing.

Sugar Cane. The old plots were cleared out and ½ acre plots planted. White ants destroyed a number of plants during the dry season, these will be renewed during the rains.

Citrus. The citrus trees were pruned and poor specimens removed.

Pineapples. Suckers are in great demand; especially Smooth Cayenne. The supply is not sufficient, enquiries are being made at Zanzibar and elsewhere to obtain a large supply if possible.

Nakuru Show. In conjunction with the Kibos Experimental Station a large and comprehensive exhibit was prepared and taken to the Nakuru Show. Over 160 exhibits were staged, and others had to be left out owing to lack of space.

The manufactured starches from Muhogo, Sweet Potatoes and Arrowroot were of especial interest, while such exhibits as Logwood and Anatto dyes, fruits such as the "Dodo" "M'sikia Punda," "Zafaranis" and other types of Mango; Washington Navel, the Zanzibar and Mandarin Oranges. The Dominica and Tahiti limes and eight varieties of coconuts, together with excellent samples of Copra, Coir, Sugar, Coco Butter, Baskets, sticks and other products of the coconut palm caused considerable comment and enquiry as to method of production, economic value, prices, etc.

Repairs. The watchman's house, the water tank, office roof and a number of tools have been repaired.

Water Supply. The supply of water is poor. Rainwater is stored in cement tanks but is not nearly sufficient for the requirements of the farm. There is a well, but the water is brackish and unfit for use.

Depredations. Parroquets, Apes and Rats were responsible for considerable damage to ripening crops in spite of careful watching.

Visitors. Very few people have visited the farm. The Hon. Director of Agriculture and the Deputy Director of Agriculture called in. The Chief of Economic Plants Division has paid periodic visits in connection with the general management.

Housing. Accommodation is badly needed. A tent is not sufficient protection either from the rains or sun.

General. A Board of Survey was held and a number of useless implements and tools condemned.

A lock-up seed store is badly needed as at present all crops have to be stored in the Tool shed, which is accessible to any native employed on the farm.

A small fumigating shed should be of great benefit as any stock distributed could be efficiently fumigated before disposal. This would help to control pests and diseases generally, every care is taken at present to send out clean stock only. All the drains have to be recut and new ones put in where necessary.

I have the honour to be,
sir,
Your obedient servant,

FRED. B. BUTLER,
Agricultural Instructor-in-Charge.

Appendix M.

ANNUAL REPORT

ON THE

Experiment Farm Kibos,

FOR THE YEAR ENDED

31st March, 1921.

The Hon. Director of Agriculture,

Nairobi.

Annual Report of the Experiment Farm, Kibos and the Agricultural work carried out in the Nyanza Province during the year ending 31st March, 1921.

As heretofore the main features of the work connected with the Kibos Farm during the above period, were the efforts made to prove the suitability of the district for growing certain export crops as well as to train Natives from various parts of the Reserve with regard to the tending and general handling of such crops.

The information gained during the carrying out of this work was of a specially useful character in view of the fact that the crops dealt with included a number and variety of those suitable both for European as well as Native cultivation.

Rainfall and Weather conditions. The rainfall and weather conditions during the year were somewhat abnormal. This will be readily understood when it is pointed out that of the total rainfall of 43.38 inches for the 12 months ending 31st December, more than half fell during the first three months of the season as follows:—

March	...	7.22 inches.
April	...	12.69 ,,
May	...	5.42 ,,

Whilst this bad distribution had the effect of ruining the maize crop on the plains and low lying country round about Kibos its effect on thehills was the production of record crops of grain.

Crops dealt with. The crops dealt with included the following: —

Beans, Chillies, Cotton, Groundnuts, Maize, Rice, Tobacco, Sugarcane, Coffee and Fruits.

Beans. The trials conducted with these included 2 varieties, viz:—White Haricot and Canadian Wonder, both of which were put in as a catch crop between rows of fruit trees during the short rains and gave fair yields of 360 lbs. and 412 lbs. per acre respectively.

Chillies. This crop suffered seriously from the abnormal rainfall referred to, a very large percentage of the plants dying off without producing fruit, only one variety was tried viz., Long Mombasa.

Cotton. This did rather well at the Farm and round about the Lake shore in the Kisumu district, but its re-introduction in the higher sections round about Maseno were attended with the same poor results as heretofore. The plants in this section whilst developing more or less normal size were badly attacked by a species of leaf fungus which evidently interfered with the nutritive functions of the plant to such an extent as to render the production of bolls practically impossible.

In the North Kavirondo district planting was confined to the lower lying country on the lake shore or contiguous with a section of the famous Uganda Cotton belt with the usual good results as regards output, but the abnormally low state of the market at the time the crop was reaped has not only resulted in a big loss to the natives but in the suspension of further planting operations during the coming season.

Groundnuts. Owing to the setback to cotton above referred to it became necessary to look around for a crop to take its place and as the popularity of groundnuts had gradually been reviving amongst the natives, steps were taken to provide a supply of seed for planting during the 1921 long rainy season. Accordingly some 6,000 pounds were issued to the Natives through their Chief in various parts of the Reserve where large shambas are being prepared to receive this seed.

At the Farm the trials carried out with this crop included six varieties as follows:

1. Big Japan.
2. Small Japan.
3. Spanish Peanut.
4. Pondicherry.
5. Mauritius.
6. Shirati.

The first five varieties which occupied a tenth of an acre each were intended for trial on the previous season. The last mentioned has done very well but the others have not yet appeared to have become acclimatised. Their general appearance throughout being rather sickly.

Maize. For reasons already given under "Weather Conditions" this crop in common with all the grain crops on the plains and low lying country round about Kibos was a practical failure. At the Government Farm an all round return of 5 bags an acre was obtained whilst over the whole of Kibos hardly 3 bags per acre was taken in.

In the hills and higher sections quite the opposite has been the case however for here the biggest crop for many years past was recorded.

Rice. Revelling as this crop does in water, the abnormally wet season experienced just suited its rapid growth and development at the Farm where this season's trials were amongst the most successful so far carried out.

During the year a short tour was made by the Chief of the Economic Plants division accompanied by myself to the rice areas in the North Kavirondo district and as a result of this tour some 5,000 pounds of rice seed from the Coast areas were obtained and most of this distributed for planting during the coming rains.

Tobacco. Planted towards the end of the rains in May this crop escaped the damaging effects of the floods with the result that a fair crop was produced.

It should be pointed out here that so far no serious attempt has been made to produce the choicer or finer types of Tobacco, but efforts have been rather directed towards producing heavy yields of the coarser types for which there is a big demand locally largely among the Indians who use it for smoking in their hubble bubble pipes. The varieties which have been found to give satisfaction in the above respects are Gold Finder, Flannagan and Connecticut seed leaf.

Sugar Cane. Interest and general attention to this crop has increased to such an extraordinary extent that it may now safely be announced that the foundation of what promises to be a huge and prosperous Sugar industry has already been laid. This does not refer only to Kibos where the newly formed Victoria Nyanza Sugar Syndicate has, during its first seasons effort dealt with nearly one thousand acres either by clearing, preparing or planting, or to the local Indian pioneer Jaggery manufacturers who are now putting under every available acre with sugar cane, but to the whole section of country stretching from Kibos to Fort Ternan where signs of activity directed towards sugar growing are noticeable everywhere.

The work on the Farm consists of Variety experiments in ten varieties of which seven were introduced during the year, being dealt with.

Coffee. In common with all the plantations in the district the trees on this Farm produced an excellent crop of berries. The percentage of light coffee being unusually small. Leaf disease made its appearance but occuring as this did towards the end of the harvest the damage traceable to this was very slight.

Fruits. The heavy rains referred to in an earlier part of this report had the effect of producing a heavy bloom on all the fruit trees which developed a fairly heavy crop of young fruit of various kinds, including mangoes, oranges, lemons and limes.

Owing, however, to the unfortunate occurence of a severe hailstorm just before these fruit arrived at the stage of maturity, fully 80% of them were ruined. The damage done was fortunately confined to oranges, lemons and limes. Mangoes not being seriously affected.

Agricultural Instruction. A definite step towards the more systematic training of natives for undertaking Agricultural Instruction work in the Province was taken during the year when a certain number of young men from various parts of the Province were admitted for training at the Farm. Past experience having shown that young boys or unmarried men were not so satisfactory, only young married men who were encouraged to settle down on the farm with their families were admitted. It is early yet for an expression of opinion regarding the boys' progress but it may be stated that each boy entered on his duties with equal keeness.

Three native cotton instructors were engaged in the Kisumu and North Kavirondo district during the season at the end of which their services were transferred to general agricultural work, that is supervising the preparation of Goundnut and Rice Shambas.

The number of apprentices on the farm now number nine, of which five were sent from Kisumu and four from Mumias.

H. H. HOLDER.
Agricultural Instructor.